DECEMBER 1957

GAS

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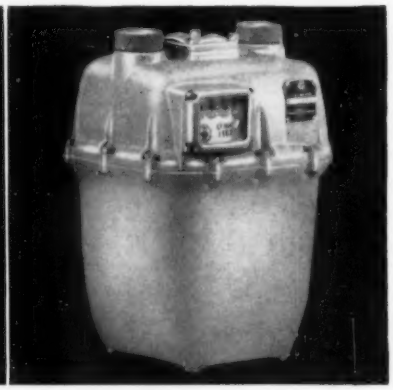

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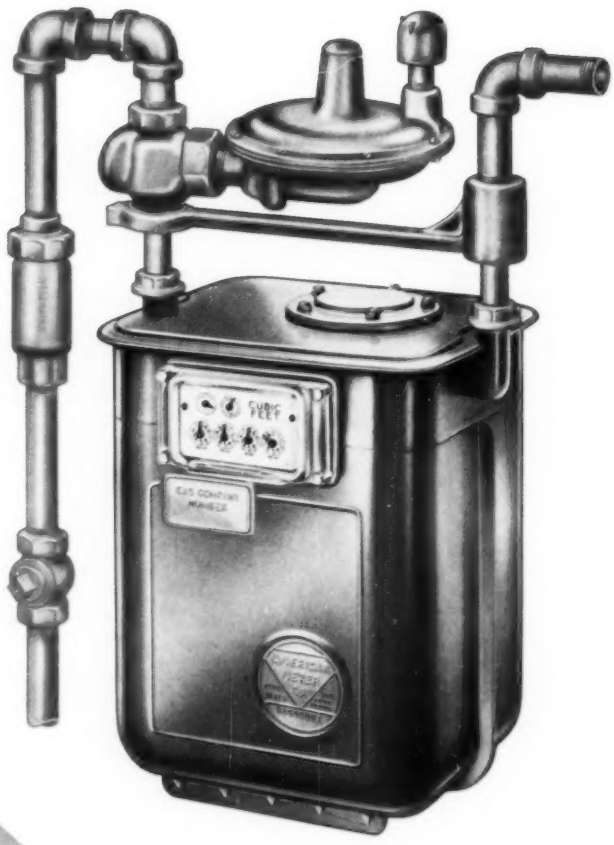

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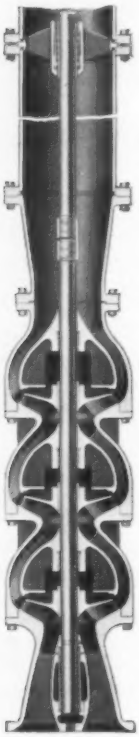

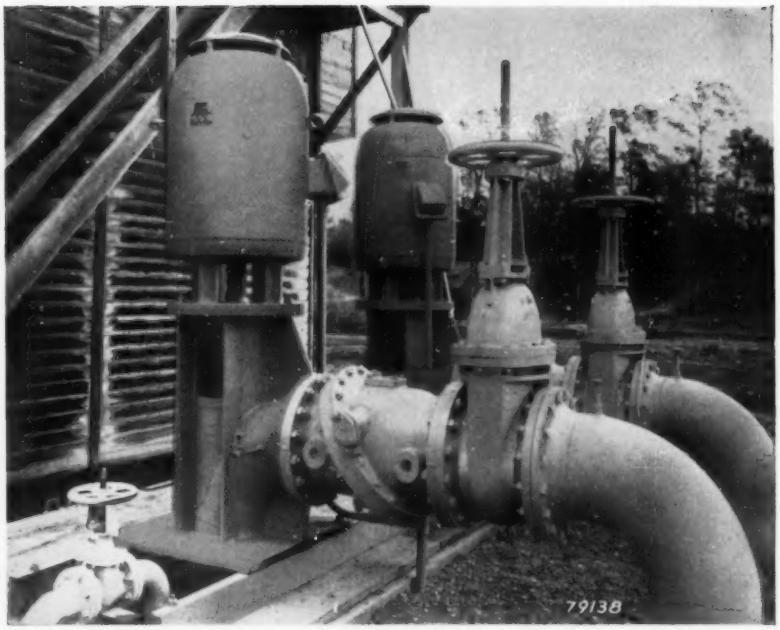

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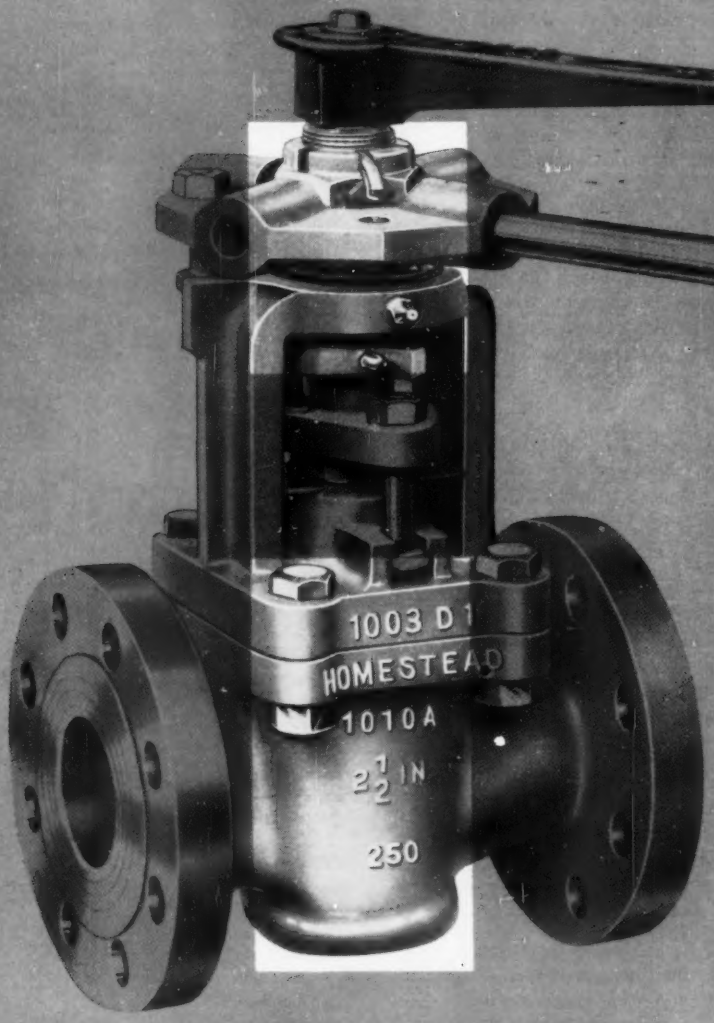

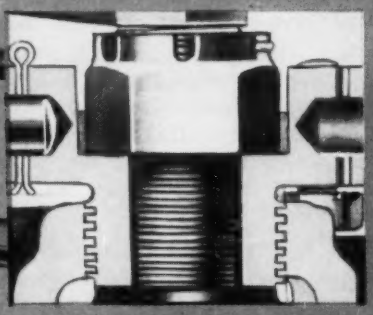

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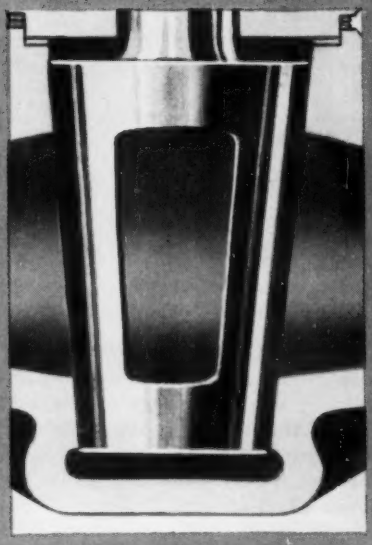

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GAS Thermally Thinking

NOW and again one reads or hears that on or about a certain date this country will have depleted its natural gas resource. Without benefit of graduate degrees in geology, a friend with a red-hot divining rod, or even a manufactured gas plant to fall back on, I will state for the record that this will not happen during your or my time.

My optimism is based on association with people who make a career of charting the path of exploration and wildcat drilling. This is the society of eternal optimists. It is also the society for application of the best scientific minds of proficient people who accept responsibility for elucidation of our history—the history of the earth—from the formation of the solid crust through the post-satellite era.

To date, geological and geophysical exploration for petroleum/natural gas have been based on the search for major structures. Faults, salt domes and anticlines have been the objectives. These are the long-known, obvious traps for hydrocarbons. Probably, most of the major producible large structures have been discovered.

Geologists, and geophysicists, are now targeting-in on stratigraphic traps. Such formations are rough to strike with conventional exploration methods. But, I know of no law prohibiting development of new equipment and techniques. Work is going forward rapidly on such projects.

To give just one example, a barrier beach or offshore sand bar is a stratigraphic trap that can hold prolific volumes of hydrocarbons. Those of interest were deposited by ancient seas and are now covered by thousands of feet of subsequent sedimentary strata. Barrier beaches and adjacent sedimentary environments can best be studied where they are being formed today.

Project 51, "Study of Near-shore Sediments and Their Environments in the Northern Gulf of Mexico," is currently active as part of the geological research being sponsored by API. Again, this is just a single effort among many. To adequately detail current, active geological research by the various agencies involved would require a whole issue of GAS, rather than a single page.

The point is that research will produce the brainpower and equipment required for new techniques in natural gas/petroleum exploration. The big danger, as we see it, is the possibility of the rapid decline of incentive. As long as our industry can present an incentive for gas discoveries, I judge we will not "run out" of natural gas much sooner than we will "run out" of beer. A static gas industry will not stimulate the needed exploration for new reserves of natural gas. A dynamic gas industry is the key to further development of this natural resource.

J. Fred Ebdon

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GAS highlights

DECEMBER 1957

SPOT NEWS, TRENDS, COMMENT ON GAS INDUSTRY AFFAIRS

An independent Canadian oil company has become the largest single owner of Trans-Canada Pipe Lines Ltd. stock. At the same time, Tennessee Gas Transmission Co. (Houston), at one time the largest single investor in the project, has bowed out of the Trans-Canada picture. TGT sold its final block of T-C stock, 189,000 shares, to Home Oil Co. of Calgary. This purchase put Home Oil at the top of the owners' list, with 702,427 shares (about 12 per cent). Home Oil, headed by Calgary oilman Robert A. Brown, has been buying T-C stock for several months, most of it from Hudson's Bay Oil & Gas and TGT, both of whom are now out of the T-C picture. Hudson's Bay and TGT say that they took financial interests in Trans-Canada originally only to help the pipeline get going. Now that it is a going concern, they are stepping out.

Carrier Corp. will enter the gas-fired residential air conditioning field "by 1960" at the latest, Board Chairman Cloud Wampler has announced. Speaking at a recent press conference in Los Angeles, Mr. Wampler indicated that Carrier has been experimenting with small gas-fired units for quite a while. Carrier now is field testing several of these new residential units in Tyler, Texas. Other field tests are planned for other areas. The new cooling unit is designed for use with gas-fired heating systems. The cooling apparatus itself will be located in a cabinet installed outside the house, and will chill water which will circulate through a coil in the furnace. Carrier already makes a residential size electric air conditioning unit, and both gas- and electric-powered air conditioning equipment for industrial and commercial buildings.

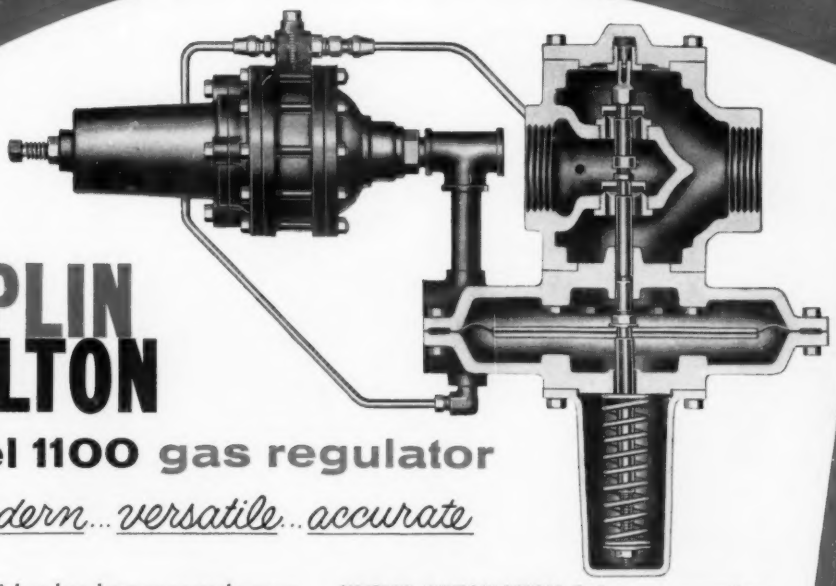
Southern California and Southern Counties Gas companies have ended a year-long battle with Southern California Edison Co. by signing a 20-year agreement to supply increased amounts of natural gas to the electric utility. The agreement ended a dispute which began when Edison announced it would build a 130-mile, 30-in. pipeline (costing $124 million) to transport 400 billion cu ft of gas which it has contracted to buy from Richfield Oil Corp. over a 20-year period. Now, under the new agreement, the electric utility will drop its plans for the pipeline, and in turn, SoCal-SoCounties will transport the gas through their pipelines to Edison generating stations. The three companies have submitted the proposal to the California Public Utilities Commission for approval.

The Institute of Gas Technology (Chicago) reached a new high in sponsored research during the 1956-57 fiscal year, IGT Director Dr. Martin Elliott has announced. Sponsored research totaled $661,000 during this period, Dr. Elliott said. This represents an increase of almost 20 per cent over the preceding year. Most of the sponsored work at IGT was applied research, but the gas industry also sponsored several basic research projects. Areas of basic research in which IGT participated during the year included physical properties of gases, new techniques for gas analysis, gas-making reactions, combustion, and applications of nuclear science. Sponsored research included projects on gas transmission, gas distribution, production of high-Btu gas from coal and oil, peak load gas processes, catalyst research, petrochemicals, utilization research and energy studies.

Another new gas-fired air conditioning unit may make its initial appearance soon. An open cycle sorption unit is being developed jointly by a Swiss company and a U. S. firm, George W. Meek and Associates. If and when the unit is ready to go, Meek will make its own arrangements to sell the manufacturing rights to the right bidder. This unit should be ready for demonstration by the end of 1957.

The U. S. Court of Appeals has set aside an FPC order authorizing Texas Eastern Transmission Corp. to convert its Little Inch from natural gas to products. The court held that the FPC failed to follow proper procedures in authorizing TET to abandon the Little Inch as a natural gas line. The court has directed FPC to conduct further proceedings. Texas Eastern has been transporting petroleum products in the line for about three months.

Transcontinental Gas Pipe Line Corp. wants to spend $126.8 million for expansion in 1958. The Houston-headquartered pipeline has asked the FPC for authorization to build 201.9 miles of 36-in. mainline loops and 131.7 miles of 30-in. loops, and add 36,080 hp in compression. Also included is a request to build 164.1 miles of 24-in. line to tie-in the Leidy (Pa.) storage field, which Transco operates jointly with Consolidated Natural Gas Co. Part of the added mainline capacity will be used to transport gas purchased by Consolidated Edison Co. of New York and Long Island Lighting Co. These two distributors are buying gas from Southwest producers. Transco will transport it to New York.



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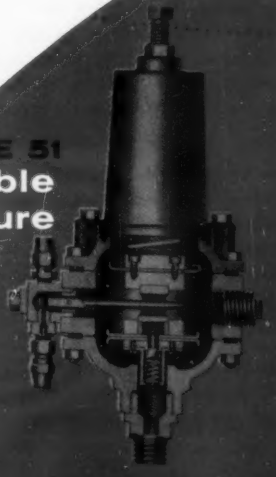

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- Twin diaphragms remove as a unit.
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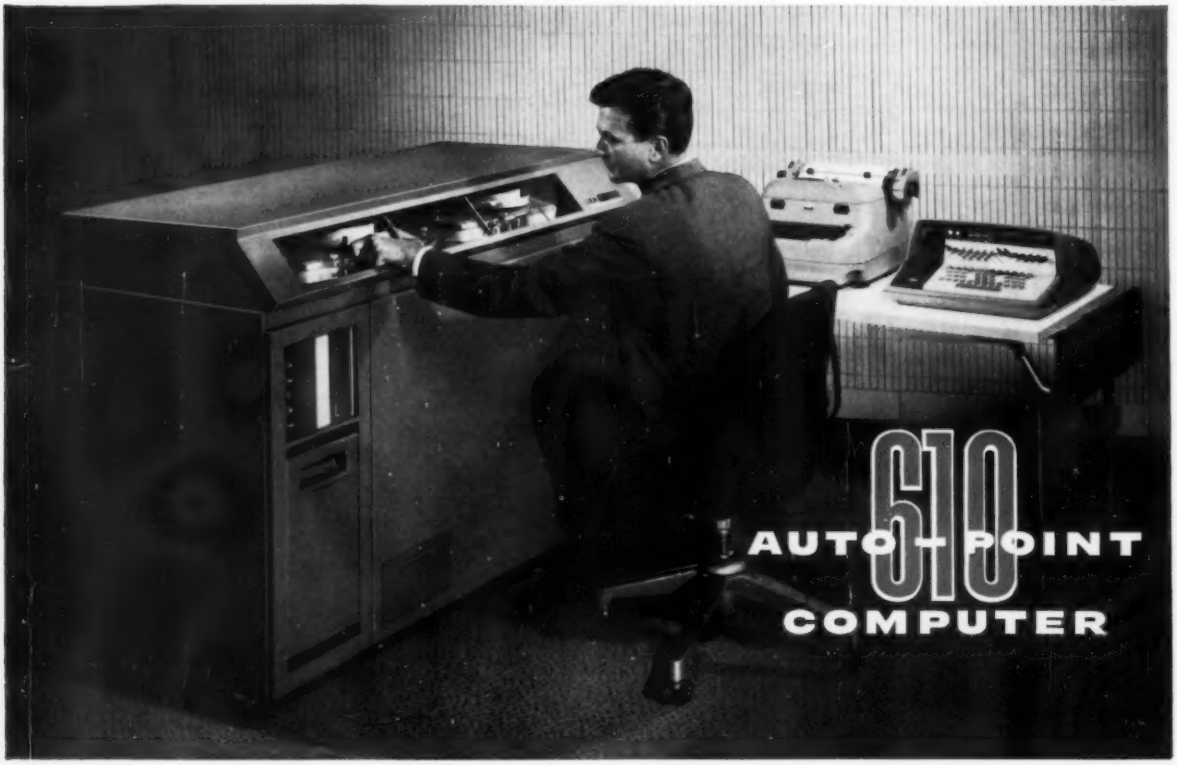

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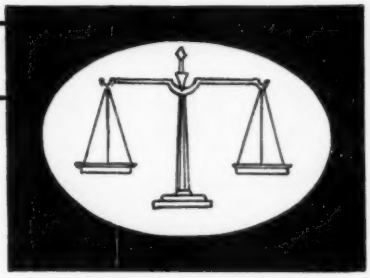

California improves regulatory climate

THE year 1957 will be significant to gas consumers and investors, because of the change in the regulatory climate in California. Utilities in California serve a population of 13 million and have billions invested in facilities to render many services. The growth in the number of consumers has increased the need for large sums of money to finance expansion. California regulation had been on a subsistence level, and its utilities had been at a disadvantage in attracting money from investors in competition with others for capital. In its latest gas rate decision, however, the California Public Utilities Commission allowed a 6¾ per cent return on a depreciated original cost rate base. In the past a 6 per cent return had been the ceiling for gas companies. California utilities had been classed with New England utilities as being less attractive for investment than those in Ohio, Pennsylvania, Texas and Florida.

With economic foresight, the California commission stated in its $18 million gas rate increase decision:

"No advantage is to be gained for either the ratepayers of applicant or the general economy of the State of California by restricting applicant to so low a return as to hamper it in the attraction of capital funds needed to meet its extraordinary obligations arising out of the rapid expansion of its facilities, which are necessary in order to meet the demands for service of a growing number of customers."

A regulatory commission has a duty to encourage good utility service as well as to prescribe reasonable rates. To provide prompt, adequate, and dependable service a utility must be financially strong. Financial strength is required to insure the confidence of investors in the basic earning capacity of the capital that is already invested in the utility, and to attract the necessary amount of new capital, on reasonable terms, to provide for additions and replacements of facilities.

A utility is in competition for the investor's money with other utilities and nonregulated businesses having comparable risks. The objectives are that investors will retain the utility securities they now own; they will make purchases in the market of securities between new issues; and they will buy large blocks promptly when new securities are offered. To develop financial vitality, therefore, a utility must pay a competitive return on its bonds and stocks. To enable a utility to pay competitive returns on the investment, it is essential that the regulatory commission authorize it to charge compensatory rates for service.

There is, of course, no guaranty of a fair return—but only a guaranty of an *opportunity* to earn adequate compensation—an elementary distinction, but one commonly overlooked. The compensation which the Constitution guarantees this opportunity to earn must be sufficient to reimburse the utility for operating expenses, depreciation, and taxes, plus a fair return. A fair return, being the wages paid for the use of invested capital, is just as much a part of the cost of rendering service as wages for labor. The utility's return to be considered fair must meet the contracted financial requirements of its bonds and preferred stock, and the economic obligation to pay competitive dividends on the common stock while retaining some earnings.

The importance of the allowed rate of return cannot be overemphasized. Small variations in the adopted percentage or rate of return are equivalent to large variations in the adopted rate base. For example, if the property of a public utility is assigned the rate base value of $100 million, a difference of one-half of 1 per cent in the selected rate of return would alter allowable earnings by $500,000.

From court and commission decisions which have considered the factors involved in determining a fair return for a utility, the following can be derived:

1. A proper rate of return (percentage) or return (compensation) is a flexible concept and not a static rule.

2. What return is proper necessitates the exercise of "enlightened judgment" in each case.

3. Current conditions are controlling, and general conditions affecting all business should be considered.

4. The return should be sufficient to assure confidence in the financial soundness of the utility, to maintain its credit and to attract the required capital.

5. The propriety of the allowed return depends largely upon the circumstances, locality and risk of the utility enterprise.

6. The return should be equal to that generally being made at the same time and in the general region on investments in other enterprises which have corresponding risks.

7. The historical cost of money to the utility, and the current cost of money should be considered.

8. A utility's corporate struc-

(*Continued on page* 126)

*A monthly commentary on national and state developments by an expert in the field of utility law.

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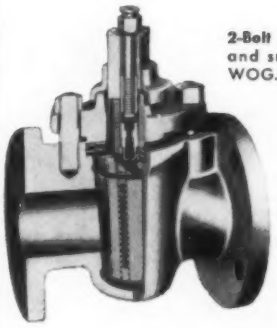
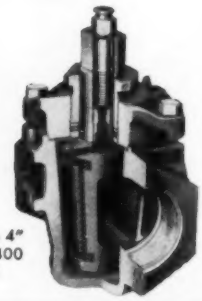
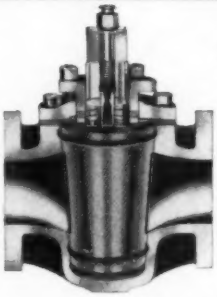


2-Bolt Cover Type Valve in 4" and smaller sizes for 175-lb WOG. *Semi-Steel*

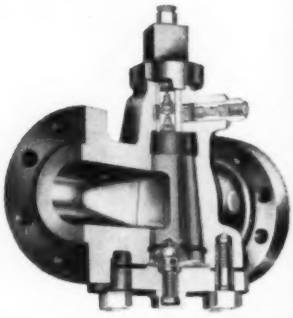


Screwed Gland Type Valve in 4" and smaller sizes for 200, 400 and 500-lb WOG. *Semi-Steel*



Bolted Gland Type Valve in 4" to 36" for 200 through 800-lb WOG Semi-Steel and ASA 150-lb and 300-lb Carbon Steel.

Hypreseal Valve—Bolted Bottom Cover Type. ½" to 30 by 34" for ASA 150-lb through 1500-lb Carbon Steel (with rectangular opening). API 2000-lb and 3000-lb WOG Alloy Steel Rectangular Opening. API 2000 and 3000-lb WOG Alloy Steel (with round opening).



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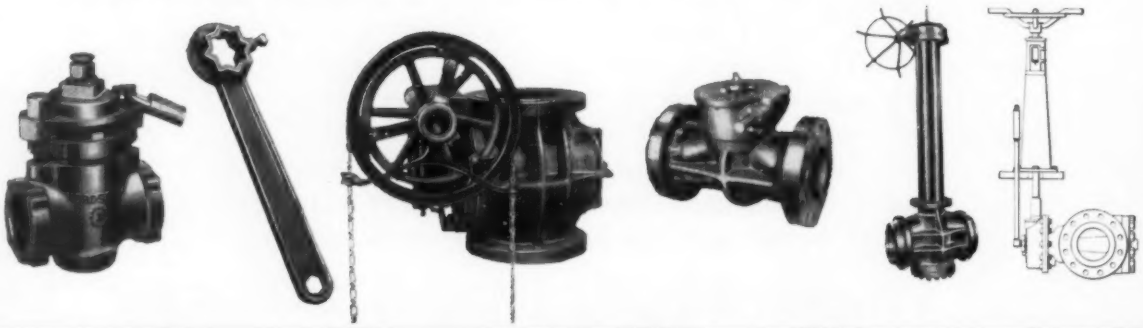

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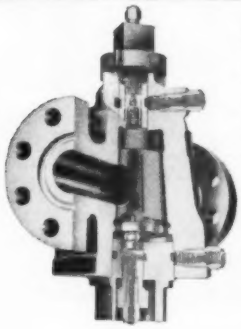
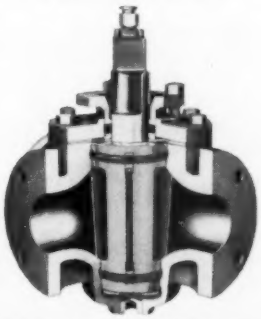
While only a few of the valve accessories are shown above, you can learn about the complete selection by talking with your Rockwell-Nordstrom sales engineer or writing directly to: Rockwell Manufacturing Company, 400 N. Lexington Avenue, Pittsburgh 8, Pennsylvania.

LINE OF LUBRICATED PLUG VALVES,

ACCESSORIES



Hypreseal Valve—Screwed Bottom Cover Type. ½" to 8" for 7500-lb WOG Alloy Steel (rectangular opening). ASA 2500-lb Carbon Steel (rectangular opening). API 5000-lb and 10,000-lb WOG (rectangular opening) and API 5000-lb and 10,000-lb WOG (round opening).



Multiport Valve Type. Available in Gland type and Hypreseal type in WOG pressures to 400 lb and ASA pressures to 1500-lb. Sizes from ½" to 24".

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SMOOTH PASSAGE: Straight-through flow without crevices . . . minimum pressure drop.

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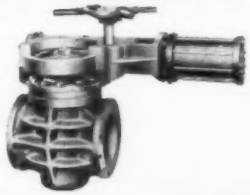
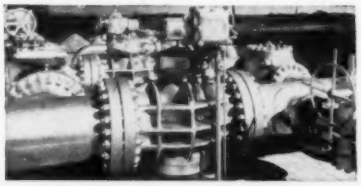
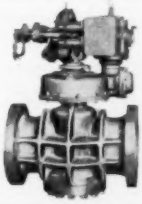


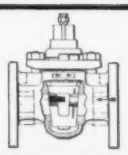




AUTOMATIC VALVE OPERATION is more dependable and economical when you specify Rockwell-Nordstrom valves. They are far superior to ordinary valves for power operation because *lubrication* reduces operating torque—smaller, less costly actuators can be used. And since there are no forced, wedged seats to be set, the actuator has only to move the lubricated plug through 90°.

Typical electric, pneumatic and cylinder operators shown above represent only three of the more than fourteen power operation arrangements available.

VALVES WITH SPECIAL FEATURES



NO MATTER WHAT YOUR NEEDS, there is a Rockwell-Nordstrom valve that will do the job better, longer and at lower cost. A few of the Rockwell-Nordstrom valves with special features are shown above.

Special metal valves are available in stainless-steel, bronze and other corrosion resisting alloys for even the toughest services. Valves with *hard faced plugs and bodies* combine the economy of semi-steel with hard facing for utmost corrosion and wear resistance. *Steam jacketed valves* for precise product temperature control. *By-pass relief valves* prevent pressure build-up that imposes dangerous stress on ordinary valves and fittings. *Gas safety control (Factory Mutual) valves* for positive control against explosion in multi-burner gas-fired furnaces, ovens and driers.

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Rockwell-Nordstrom valves and accessories are available at leading oil field and industrial distributors everywhere. For full information write: Rockwell Manufacturing Company, 400 N. Lexington Avenue, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

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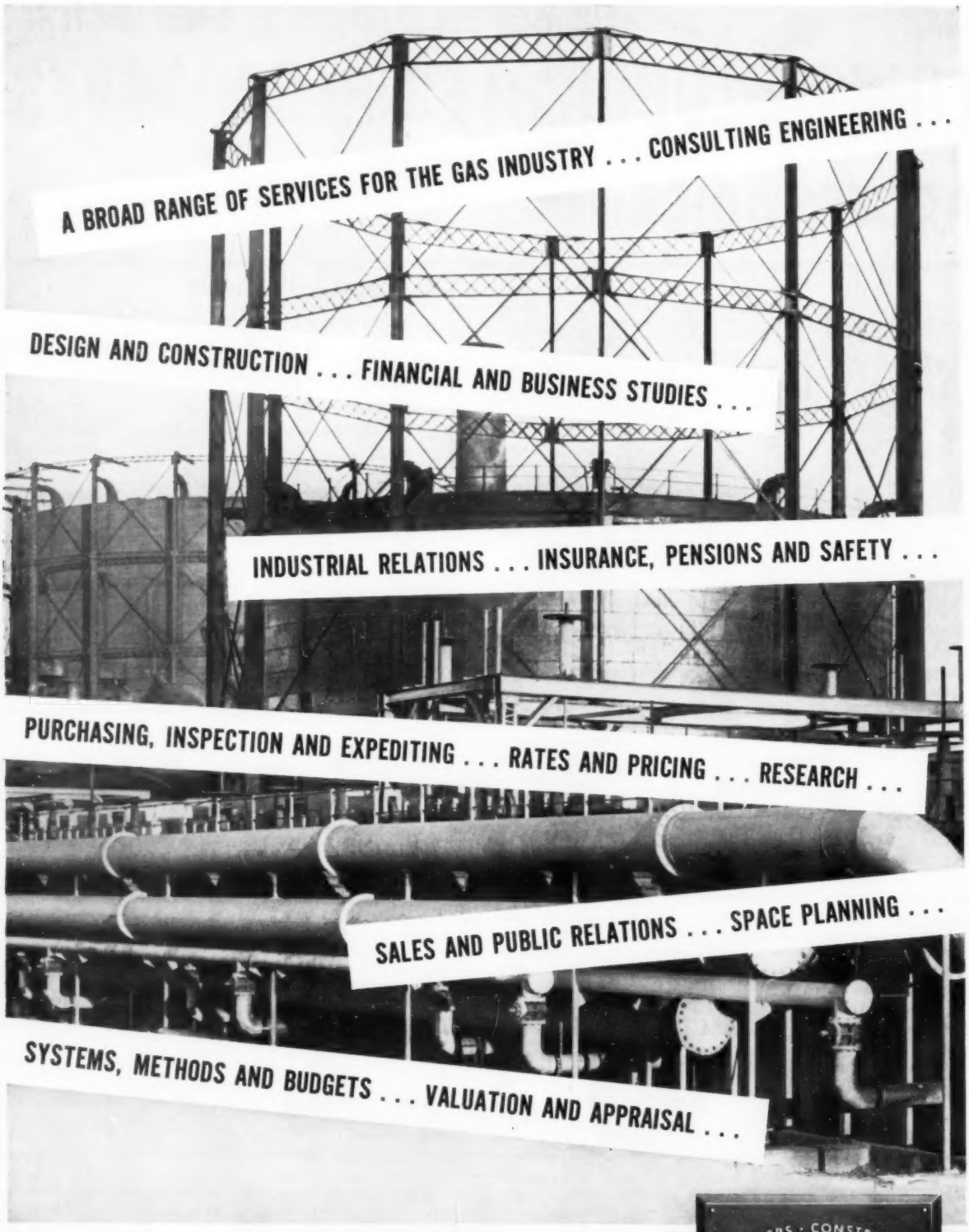
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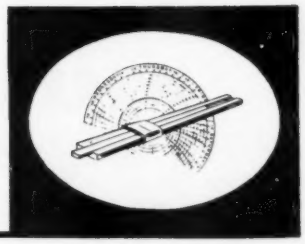

By GUY CORFIELD

Synthetic ammonia

The present and future consumption of synthetic ammonia is quite important to the gas industry inasmuch as 70-75 per cent of the current United States total annual capacity—5 million tons from 54 plants—comes from hydrogen produced from natural gas. The hydrogen is reacted with atmospheric nitrogen, over a catalyst. About 3.5 million tons of this ammonia is used for agricultural fertilizers and of it, 60 per cent is applied directly to the ground as ammonia and the remainder converted to nitrates and other nitrogen compounds. The remaining 25 per cent (of the total) divides as follows: 15 per cent into industrial explosives, and 10 per cent to miscellaneous applications such as fibers and textiles, plastics, refrigeration, and a variety of chemicals.

There are some regional unbalances between supply and demand, and imports of nitrate fertilizers are an unsettling factor. On an overall national basis it is thought, however, that plant capacity is about up to demand. There will therefore probably be no significant enlargement or reduction of the synthetic ammonia program unless a major war or other unforeseen or unusual demand develops.

Reducing water evaporation

It is estimated that, for average climatic conditions in the U. S., open water reservoirs lose about 30-in. depth by evaporation each year. This can be translated into large sums of money, an acre-foot being worth $50 or more. It is natural, therefore, that much thought and research has been devoted to reduction of this loss. Covers, either mechanically supported or floating, can be used on small reservoirs, but soon become impractical with size. The best approach has seemed to be by floating some non-miscible liquid on the water surface.

As usual with such a project, which in a sense is tampering with nature, there are many problems, some obvious and some speculative. The material must be cheap, able to form a very thin film on the water, and be at the most only slightly soluble in the water. It must spread easily so that application is not a problem, and quickly re-form the film that may be ruptured by wind, rain, and waves, or congealed by freezing temperatures. It must not be toxic to humans, animals, fish, vegetation, plankton or algae, nor stimulating to undesirable algae or bacteria. A film might even be too efficient in preventing evaporation because the cooling effect of evaporation might also be reduced and the water get too warm and the biological content be upset.

One of the most promising surface treatments appears to be cetyl alcohol, one of the "higher" alcohols with chemical formula $C_{16}H_{33}OH$. It is now used extensively for cosmetics, sunburn lotions, etc. If it could be successfully spread, it is calculated that about 2 lb would cover a 320-acre lake with a film that would last 6 weeks. The material cost would be about $1, and evaporation from the lake would be cut 45 per cent.

Converting sunlight to electric energy

It is of course readily apparent that the sun's rays can be used to obtain heat energy and that such heat could be converted into electrical energy. The scientists, however, in their search for new energy sources, are studying the direct conversion of solar heat to electricity.

Methods of conversion are known and have been accomplished on a small scale. The silicon cell, made of a thin disc of high-purity silicon treated with a small amount of arsenic and a trace of boron, generates a small electric current when exposed to sunlight. Bell Telephone laboratories have succeeded in generating sufficient electrical energy, from an assembly of 400 such cells, to operate an isolated telephone system. The Army Signal Corps has done similar work. A cadmium sulfide cell has also been developed.

Portable sun-powered radios, deriving their electrical supply from sunlight, have been constructed by the International Rectifier Corp. They use light-sensitive selenium cells, similar in principle to the well-known photographic light exposure meters. They will operate continuously in direct or diffused sunlight.

Another means of conversion is, of course, the thermocouple which will develop an electric voltage when heated. Many combinations of couple metals and alloys have been tried, and large groups of couples (thermopiles) will generate a significant quantity of energy. So far they have not been very practical because of size and expense. There are, however, reports of installations, using desert sunshine, which are producing enough electrical energy to provide cathodic protection to buried pipelines.

What is believed to be one of the most promising possibilities, though it is still very far from practical accomplishment, is the production of hydrogen and oxygen by the photochemical breakdown of water when exposed to sunlight. This reaction can be promoted with the aid of various photocatalysts. Theoretically, the steps and necessary equipment are relatively simple. The conversion to electricity would be done by "burning" the hydrogen in a hydrogen - oxygen "fuel cell." These fuel cells are, in essence, electric batteries having electrodes or interior terminals at which the two gases are introduced. The gases unite within the battery and produce electrical energy which develops as voltage between the outside terminals. ■

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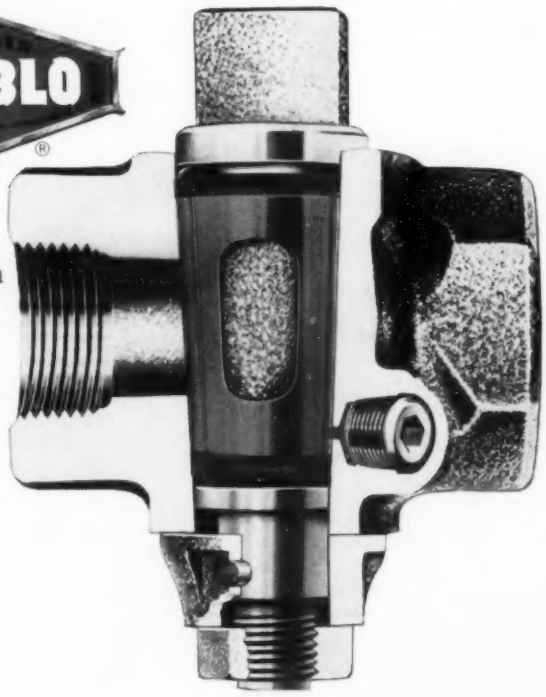

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WASHINGTON

"Coal" amendment may split support of natural gas bill

by NEIL REGEIMBAL
GAS Washington Bureau

NO matter how it's sliced, the outlook for passage of the Harris-O'Hara natural gas bill next year comes out thin. Some of the most optimistic backers of the measure to relax federal controls over independent producers admit the prospects at this point are bleak.

There are lots of reasons why this is so, but boiled down, they hinge on shifting congressional tempers. Factors ranging from the Russian Sputnik to the Little Rock racial turmoil have taken the 1958 congressional session out of the realm of an ordinary election-year meeting, which in itself would have worked against the gas bill.

Possible inter-party agreement on the few measures on which both sides could have agreed, such as the gas bill, has been shot full of holes. Southern Democrats, who were ready to trade votes to collect the support of some Northern Republicans for the gas bill, are hardly willing to enter any alliances because of racial questions.

Sputnik may be opening new vistas in space, but it is also setting up new political spheres, working against any bipartisanship, and opening new ranges of controversies to be explored next year, including defense spending, military budgets, aid to education, and the general question of who, if anybody, goofed in our military research program.

As a result of this shifting congressional temperature, many insiders flatly predict that the pipelines are going to have to swallow the so-called "coal amendment" to the gas bill—which would give the Federal Power Commission control over direct industrial sales — if there is to be even an outside chance of passing the bill.

This is proving to be a mighty hard mouthful to get down the gullet for a lot of the pipeliners.

The best guess, as fall eased into winter in Washington and the Jan. 7 opening of Congress neared, is that the coal amendment will be put in the bill, and that the pipelines will split. Some will reluctantly go along, others will become outspoken foes of the measure because of it.

Supporters of the bill, mostly the independent producers, say the votes represented by the coal states are necessary if the bill is to stand a chance of passing next year. Thus, they claim, the coal amendment is a must. And they add that obviously the loss of some pipeline support won't remove directly as many votes as the coal interests will bring in.

But there's some fear in Washington that as soon as some of the pipelines, especially those with heavy direct sales, begin opposing the measure, the other opponents of the bill will come up with some toothsome and heady ammunition to strengthen their fight.

At this point, according to some sources, is where the bill is mortally wounded, and the gas industry again becomes a house divided.

Where will the bill's death leave the gas distributor and his consumers? On the surface, they would not seem to be any better or worse off than at present, even though many distributors have this year come around to the view that the bill is needed to insure continuing supplies of gas for interstate shipment.

Rep. Charles A. Wolverton (R.—N. J.), in a recent statement may have given the answer. "The present situation appears to encourage the use of natural gas within the states where produced rather than in the more populous areas where it has the greatest usefulness," he told his congressional colleagues.

This is the problem the pipelines will have to resolve over the next few weeks as they consider whether to accept control over their direct industrial sales or risk the threat of diminishing supplies of gas.

Thus the fate of the bill rests now on even further compromise among diverse interests. Failure of these interests to reach agreement seems certain now to doom the bill next year, and probably for some years to come if not for good. Even if a full compromise is reached, and all potential backers of the bill are placed neatly in line, there is still considerable doubt that the bill will make the grade next year. A united gas industry front, however, will improve its chances for eventual passage, perhaps in 1959.

As things now stand, there is no chance the bill will be passed over without a vote next year, whatever its prospects, as it was delayed in the final days of this year's congressional session. A bill not passed next year will automatically die when Congress adjourns. Thus there would be nothing to gain and everything to lose by holding the bill back, top congressional leaders

(*Continued on page* 122)

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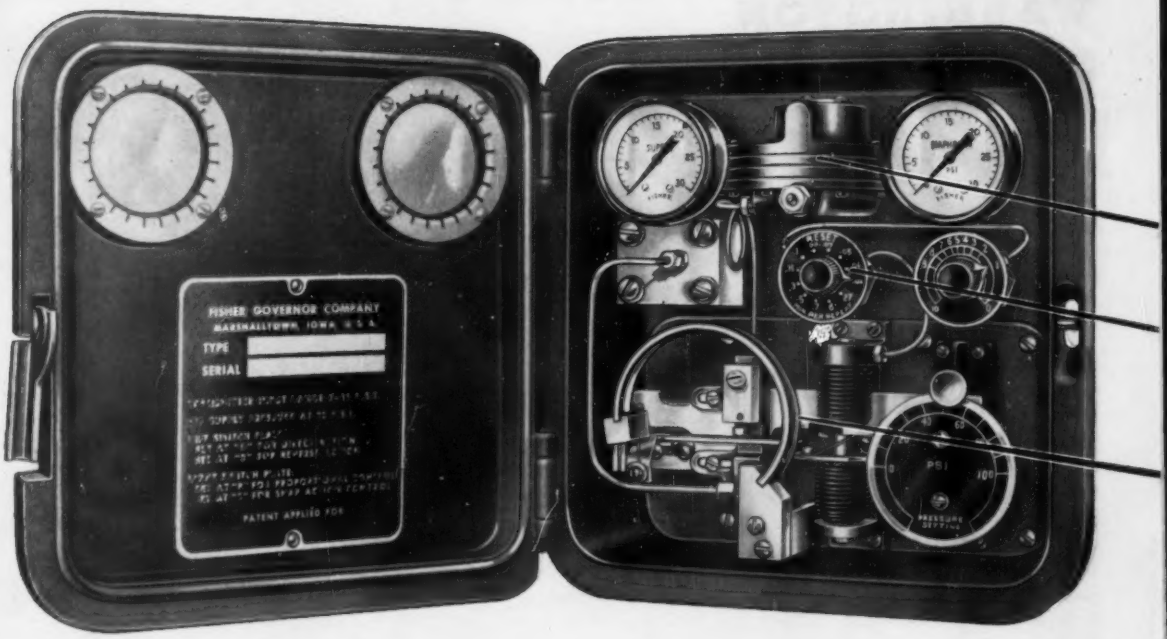

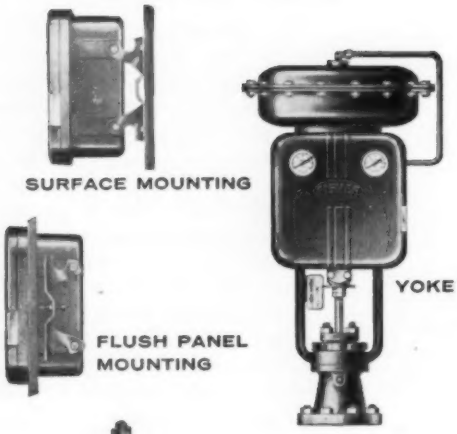

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Resolution Sensitivity	Minimum Change Required in Measured Variable to Produce an Effective Movement of Final Control Element is 0.1% of Bourdon Tube Rating.
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Resonant Frequency	Unaffected at Usual Motor and Turbine Speeds.
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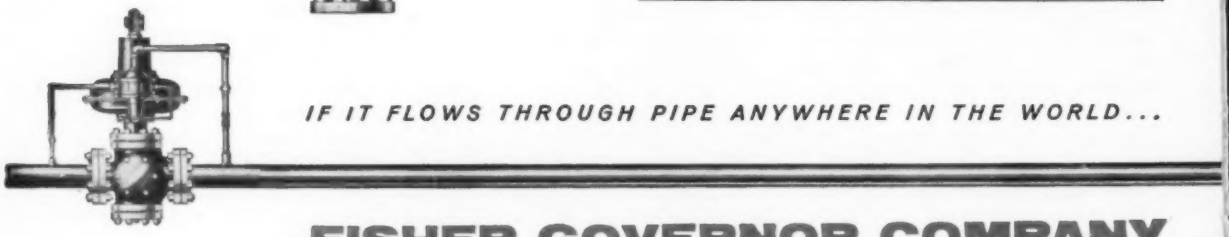

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The Wizard II has been designed to specifically meet the demands of modern, complex systems requiring closer control. The Wizard II retains all of the basic simplicity, accuracy and dependability of the Wizard 4100U, plus its own exclusive features.

The new design consists of two sub-assemblies encased in a weather proof die cast aluminum housing which is provided with a ¼" pipe threaded vent for gas service. Either assembly can be removed without disturbing line connections.

The upper assembly consists of two gauges, relay and proportional band adjustment. The lower assembly includes the set point adjustment, proportional bellows, Bourdon tube and nozzle. Each assembly is assembled and calibrated before mounting in the case. The case can be mounted on a flush panel, a wall or on the yoke of the control valve.

Careful and exhaustive tests have conclusively proved that the Wizard II measures up to rigid Fisher standards.

A completely descriptive and illustrated bulletin on the Wizard II is yours for the asking. Write for Bulletin No. D-4150.

The original Wizard I is still available for those applications not requiring volume relay and reset features.

CHANCES ARE IT'S CONTROLLED BY...

FISHER® *Controls*

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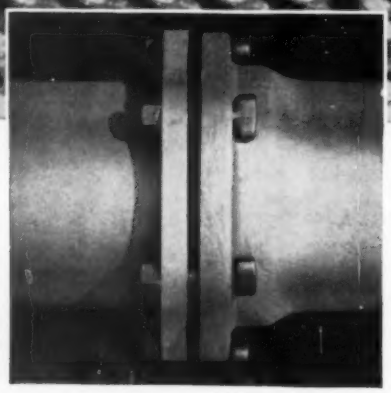
CAST IRON PIPE...



MECHANICAL JOINT

CAST IRON

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, Suite 3440, Prudential Plaza, Chicago 1, Ill.

cast iron

ALWAYS AVAILABLE, ALWAYS DEPENDABLE

No periodic shortages to slow down construction

Why wait and worry? When new construction is needed, specify cast iron and relax. Cast iron pipe will be ready when you are. To availability, add dependability. Cast iron is America's longest lasting pipe.

Proof? 40 American gas companies still use cast iron gas mains laid over a century ago! Mains with 50 and more years of service are common.

Today, *modernized* cast iron pipe, centrifugally cast, is even tougher, more efficient. Standardized mechanical joints are bottle-tight under all gas pressures . . . and for all types of gas. Wall thicknesses are uniform. Joint design allows deflection during and after installation. Service lengths and ample variety of standard fittings cut time, labor in congested undergrounds.

For dependability, long life, long-term economy, specify cast iron.

Installed as part of Chicago's gas system in 1850, this 4-inch cast iron pipe was finally retired. Upon examination, after more than 100 years of continuous underground service, it proved to be in excellent condition. Here's another example of cast iron pipe's long range reliability and economy. It pays to specify cast iron pipe . . . especially today. *Modernized* cast iron pipe is even more rugged.

A FEW OF THE 40 GAS UTILITIES WITH CENTURY-OLD CAST IRON MAINS IN SERVICE

Peoples Gas Light and Coke Co., Chicago—Baltimore Gas and Electric Co.—Philadelphia Gas Works—Richmond Gas Works, Richmond, Va.—Hartford Gas Company, Hartford, Conn.

pipe FOR MODERN GAS DISTRIBUTION

16" Feeder Gas Main in a Large Mid-western City Subdivision.

to judge the future, study the past

One sound indication of what a product will do is...what it has done.

For example: the record of cast iron pipe in the gas industry. Over a hundred years ago, 40 American gas companies installed cast iron mains that are still in service. Hundreds of other companies are using cast iron gas mains with 50 and more years of operation behind them.

This record speaks for itself. And its message is crystal clear: no other pipe can match cast iron for long life. For dependability. For long-term dollars-and-cents economy.

Equally important, the modernized cast iron pipe being produced today is even more uniform and dependable.

Here's the "WHY" Behind Cast Iron Dependability

- Standardized mechanical joints are bottle-tight for usual gas pressures . . . and for all types of gas.
- Centrifugally cast pipe is tough, strong and uniform.
- Joint design allows for deflection during and after installation.
- Service connections are easily made.
- Long life a matter of record.
- No shortage. Cast Iron Pipe is available.

U.S. cast iron PIPE
CAST IRON

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER
FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

The new Superior ALUMINUM CASE METERS

. . . the slow-motion meters you can rely on longer

This slow-motion, long-lived meter operates at only 7 revolutions per cubic foot to reduce wear and stay accurate longer. And its simple, horizontal seam construction gives fewer chances for leaks . . . makes maintenance quick and simple. Whether it's adjusting the tangent through the handy access in the top . . . removing the top to grind the valve seat . . . or lifting out the valve table with the entire inner movement to replace the diaphragm, simply loosening a few screws makes everything accessible.

Get full details. Send for bulletin 1150.

This modern meter exploits all the time-tested advances in meter technology *plus* the latest manufacturing techniques of Superior's new plant.

SUPERIOR METER COMPANY, INC.

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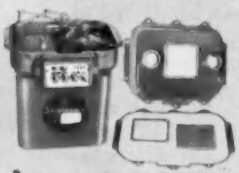
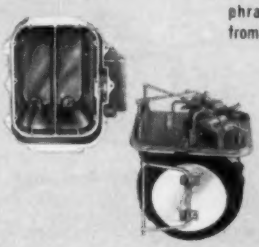
neptune

Look at these advanced design features:

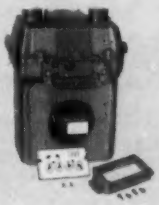
1. Simple, horizontal seam . . . eliminates leakage . . . easier maintenance
2. Easily accessible table . . . just remove the screws holding top



3. Meter top removable without taking off index box
4. Valve seat readily accessible for grinding when top is removed
5. Slow movement; only 7 revolutions per cubic foot
6. Seam gasket stays resilient . . . cork and Buna-N composition
7. Valve table lifts out with entire mechanism



8. Heavy-duty, sintered bronze bearings oil-impregnated for life
9. Flag arrangement gives arm smoother operation and longer life
10. Accurately controlled diaphragm . . . no inaccuracies from deflection
11. Cupped handling lids permit easy and safe carrying
12. Handy access for tangent adjustment and calibration
13. Broad base for solid stacking . . . designed for conveyorized handling
14. Index removable without removing meter



In 250 cfh and 340 cfh sizes to meet most domestic requirements.

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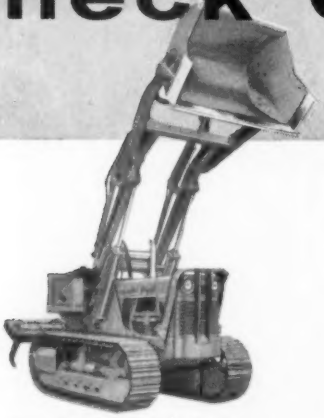
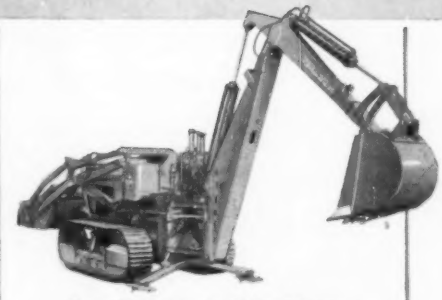
PRICE AND PERFORMANCE!



Crawler-mounted loaders

Five sizes — ½ to 2-cu yd. — with exclusive "knock-out" dumping action, plus improved bucket rollback. Extra-high dump clearance simplifies loading high trucks and hoppers.

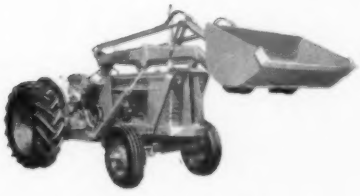


Crawler-mounted backhoes

Exceptional power and stability for tough digging in hard ground, steep grades, etc. Digs 12½' below grade. Available with various dipper sizes and optional front-end loader or dozer.

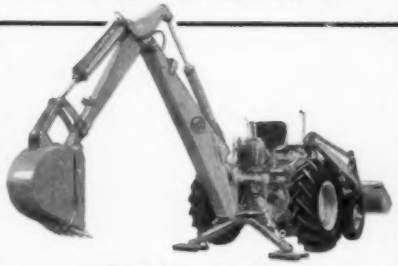
Crawler fork lift

Keeps jobs moving in any weather or terrain. Unloads trucks . . . carries, lifts materials to 21'4" height. Mounts quick-change loader, dozer, concrete bucket, log-grab, or crane hook.



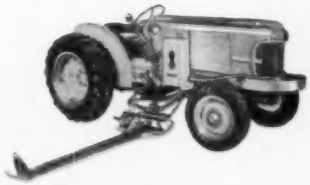
Wheel-type loaders

Beats any ½-yd. loader you ever saw for light loading, backfill and clean-up. 100% Case-engineered, Case-built, with heavy-duty lift-arms and automatic power-leveling.



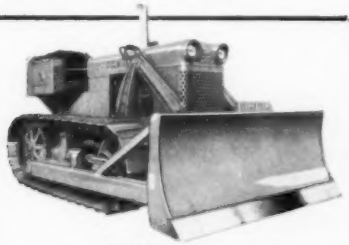
Wheel-type backhoes

Lowest-priced combination backhoe-loader on the market. Heavy-duty industrial design, with hydraulic foot-controlled 180° swing, telescoping stabilizers, many other advanced features.



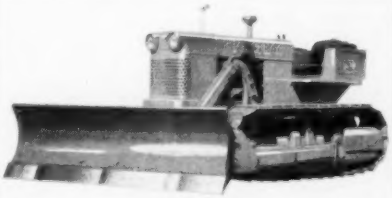
Rubber-tired prime-movers

Three economical sizes — 42, 60 and 100 HP —with high-torque Case engine for operating mower, grader blade, etc. Also ideal for miscellaneous winching and drawbar work.



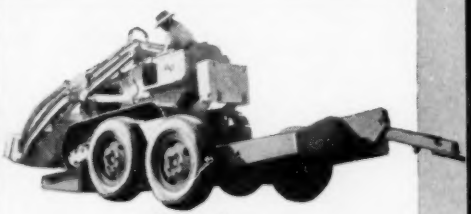
Bulldozers

Seven low-cost models under 80 HP — four with torque converters — plus larger sizes up to 100 HP, with max. 24,000 lbs. drawbar pull. Largest models feature optional "power-tilt."



Angledozers

Eleven gasoline and diesel-powered models from 42 to 100 HP. Largest models have torque-converter drive, instant power-shift, power steering—plus exclusive "power-angling" blade.



Tilt-trailers

4 or 8-ton capacity. Easily loaded or unloaded by one man. Available at saving of $500 to $1000 under competitive trailer prices with purchase of new TerraTrac crawler.

Maybe you didn't realize it . . . but J. I. Case Company now builds the *most advanced* line of industrial tractors and equipment of any single manufacturer in the 40 to 100 HP range. You can choose from a complete family of new Case-built prime-movers — *both wheel-type and crawlers* — plus a full line of matching loaders, bulldozers, backhoes, fork lifts and trailers. There's a rig for every need and budget — with just *one warranty, one service source, one easy financing arrangement,* on each complete machine. See your nearest Case Industrial Dealer for full details.

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Send literature and prices on equipment checked.

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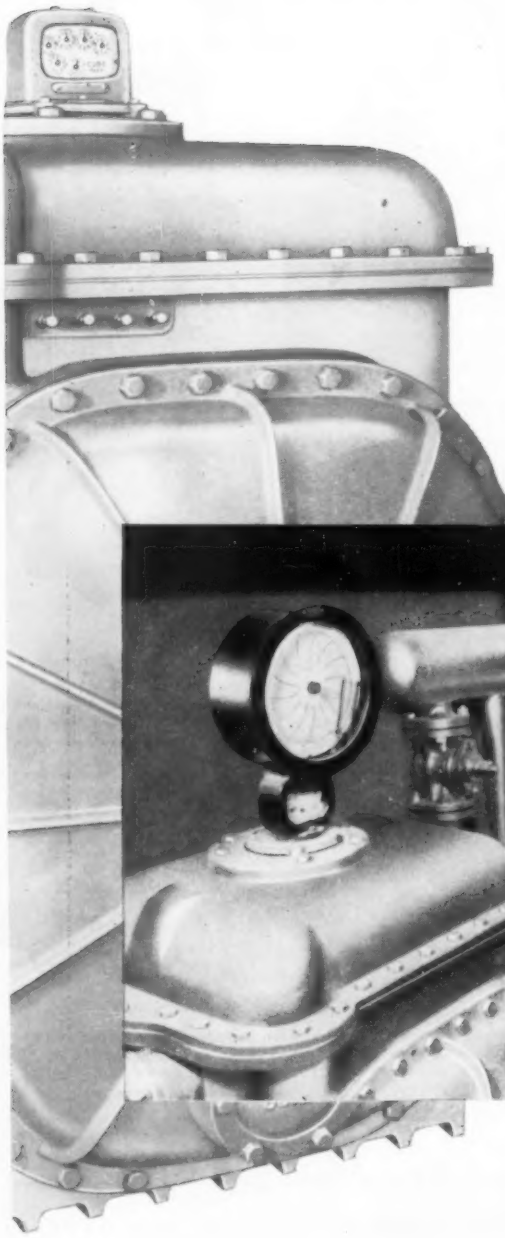
From a few feet to MANY THOUSANDS



LONG-LASTING ACCURACY IS ASSURED WITH AMERICAN®

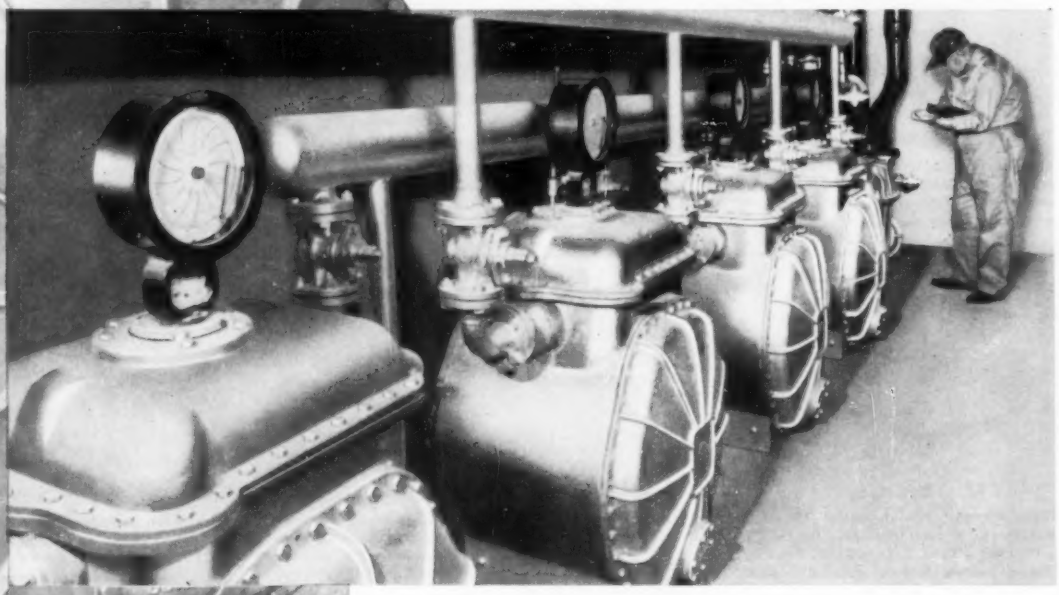
IRONCASE AND ALUMINUMCASE METERS

With American Meters on the job both the gas company and the consumer are sure of precise measurement accuracy under all conditions year-in-and-year-out.

When the measurement job is a big one, American Ironcase or Aluminumcase Meters are the logical choice. Demand rates and variations in pressure are measured and recorded with these high pressure meters equipped with Volume and Pressure Gages. For measurement with varying pressure and temperature, American Base Pressure and Base Volume Indexes continuously indicate gas volume at base conditions.

American 80-B, 250-B and 500-B Meters are supplied in Ironcase and light weight Aluminumcase models for operating pressures to 100 psi.

Write now for full information.



This battery of large American Ironcase Meters with Volume and Pressure Gages in a large commercial installation measures gas for year-round air conditioning, cooking, hot water, clothes drying and incineration. Total consumption is approximately 212,000,000 cubic feet annually.

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INCORPORATED (ESTABLISHED 1836)

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SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

Replace services without trenching

Tubing of Tenite Butyrate can be run through the metal pipe

Plastic tubing of Tenite Butyrate makes natural gas service replacements easier—and more economical. This tubing eliminates the need for trenching—the most expensive operation in service replacements. Only two holes need be dug: one near the gas main tap, the other at the service riser. Tubing of Tenite Butyrate is then run through the corroded metal service line. Since plastic creates less friction than metal due to the smoothness of its walls, pressure is unaffected by the slight decrease in diameter of the service line. Easy-to-use adaptors make connections between tubing and metal pipe.

Installation time is further cut because tubing of Tenite Butyrate is easy to handle. It is so light in weight that an average service of 70 feet weighs less than four pounds.

The economy does not stop with installation, however. Tubing made of Tenite Butyrate withstands soil corrosion or electrolysis—so you are assured of many years of trouble-free service.

Since 1943, extensive field use has demonstrated the many advantages of Tenite Butyrate over metal for natural gas service. One company has already installed nearly 3,000,000 feet of Butyrate tubing—for both new and replacement service lines.

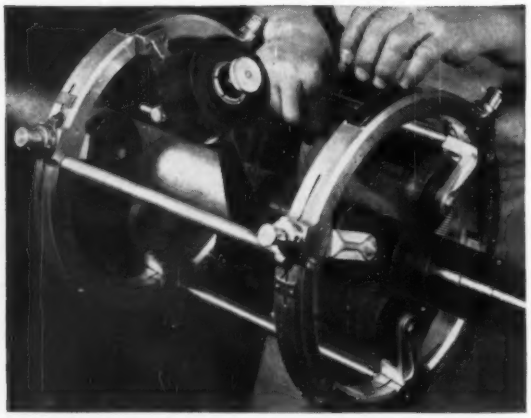
Discover how you can share in the benefits offered by this Eastman plastic. At your request we'll send more information about the tubing, fittings, and their installation, plus a list of suppliers in your area who handle tubing made of Tenite Butyrate. Write: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

A 16mm. sound-color film, "Plastic Pipelines," is available upon request.

TENITE
BUTYRATE
an Eastman plastic

1932—EASTMAN'S 25TH YEAR IN PLASTICS—1957

One of these three is the tape coating for you



Polyken No. 900—12 mils, the original all-inclusive tape coating for straight-run applications.

Polyken No. 920—20 mils, thick and tough for heavy-duty use on straight runs, yet it's conformable, too.

Polyken No. 940—12 mils, just the right balance between elasticity and super-conformability for use on irregular pipe structures.

Only if you use a *Polyken* polyethylene tape on *accessory* jobs are you getting the most for your money

Whatever your need in accessory tape coatings, you will find a *better* solution at *lower* cost with one of these Polyken tapes.

Top corrosion fighter

Why Polyken? Because only Polyken has successfully developed the complete line of polyethylene tape coatings. And no other tape coating—*absolutely none*—can match the remarkable properties of Polyken polyethylene:

- **tough and elastic**
- **unplasticized, non-drying film**
- **doubly thick adhesive to seal all voids**
- **far higher adhesion for a true bond to pipe surface**
- **lower water vapor transmission rate**
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Compare the cost of each Polyken tape with that of the competitive tape it surpasses. See for yourself on your next purchase order.

Here is your Polyken Distributor . . . Contact him now.

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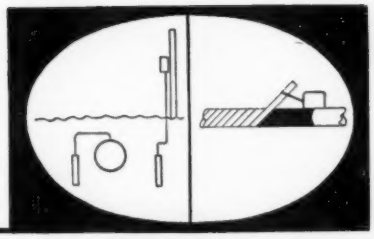


By MARSHALL E. PARKER

A new criterion for cathodic protection

By Gordon N. Scott, Consulting Engineer, Los Angeles

THE author presents a new criterion for the cathodic protection of pipelines, based upon the attainment of an adequate degree of polarization at the metal surface. The measurements taken are independent of IR drops between the electrode position and the pipe.

The observed potential at any point on a line under protection is viewed as made up of three components: the base potential, or that which was in effect prior to the application of current; the driving voltage, which is determined by the difference in the potential with the protective current on and off; and the polarization potential, which is the difference between the off potential after the line has been under protection for some time and the original base potential. These potentials all are to be corrected to a uniform temperature base (the author uses 77°F) because of the variation of the electrode with temperature.

Cautions are given as to the timing required for the correct reading of the "off" potential, and the errors resulting from this source are discussed.

When the polarization potential is plotted as a function of the driving voltage, it is found that the relationship is not linear, but that the curve is composed of two essentially linear parts with a definite "break" in the slope. This break is the critical point, according to the author, at which cathodic protection is achieved.

Accordingly, the observed potential at each point on the line must reach a value which is the sum of the original base potential, the driving voltage associated with the break, and the polarization potential associated with the break. Examples were given of lines for which the criterion thus derived varied from 692 millivolts to somewhat over 1 volt.

The author points out that the technique described for conducting tests and taking the measurements can be applied to the design of systems using the 0.85 volt criterion, or any other which is desired.

Cathodic protection of a gas distribution system

By Edward F. Fowler, Northern Illinois Gas Co., Bellwood, Ill.

THIS paper describes the operational procedures involved in the corrosion control program of a gas distribution system in the Chicago suburban area. Some 260 communities are included; approximately 43 million feet of main, from ¾ in. to 48 in., including more than 7 million feet of cast iron, are involved. Coating has been used on steel pipe since 1930; cathodic protection was initiated in 1942, at first as a modification of stray current control. By 1945 the advantages of cathodic protection were so apparent that a policy was adopted of applying it to (1) all newly laid lines, (2) existing primary mains, and (3) eventually the entire system, to the limit of its applicability.

The company has found that, for its area at least, it is practical to design cathodic protection installations without field tests; i. e., values of coating excellence and of soil resistivity are assumed, on the basis of experience. It is claimed that only about 2 per cent of the resulting installations are sufficiently too large or too small to require re-design, and the saving in survey time is enough to absorb this additional expense. All installations are carefully examined after installation, and such corrective measures taken as found necessary.

An important feature of the process by which an entire community distribution system is placed under protection is the study which precedes the design. The corrosion section cooperates with the planning section in this study, so that an opportunity is afforded for the replacement of undersized mains, as well as those whose condition warrants replacement. The anode installation is concurrent with the main and service replacement, and the final survey gives an indication of the degree of protection achieved, and a chance to supplement it when indicated.

"Hot spot" protection is obtained by correlating anode installation with leak repairs; some areas have been almost completely protected in this way before the corrosion section was able to make a real study, due to the press of other business.

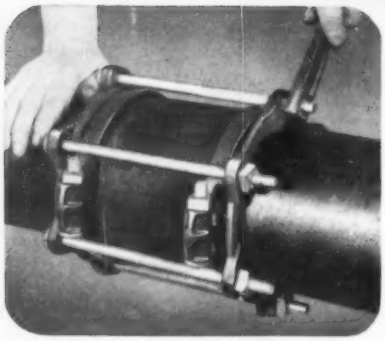
Service insulation has proved a major problem, as it has with many others. A special instrument has been devised for testing these insulators, and will be the subject of a forthcoming paper.

An ingenious system for installing single magnesium anodes on mains with a minimum of excavation is described.

The total cathodic protection installations of this company, up to 1957, include 35,000 magnesium anodes, 109 rectifiers, and 17 drainage switches. Fifteen million feet of main, plus its service piping, is considered fully protected; the company anticipates complete coverage of all its steel piping within ten years.

These articles have been abstracted from papers presented at the NACE South Central Regional Conference held in Oklahoma City in October.

FOR THREAD LEAKS AT FITTINGS



FOR EVERY TYPE OF COLLAR LEAK

SKINNER-SEAL COLLAR LEAK CLAMP, with its sealed *gasket* and massive construction, stops every type of collar leak.

SKINNER-SEAL PIPE JOINT CLAMP for pipe repair permanence. Stops leaks at joints where pipe is screwed into a fitting. Any temperature—pressures up to 2,000 pounds. It saves the cost of tearing out and renewing leaky fittings. Prevents shutdowns. This clamp, constantly improved over the years, has been serving the industry for over half a century. In stock at all supply stores!

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COLLAR LEAK CLAMP

SKINNER-SEAL

MUELLER CO.

growing with the gas and water industries

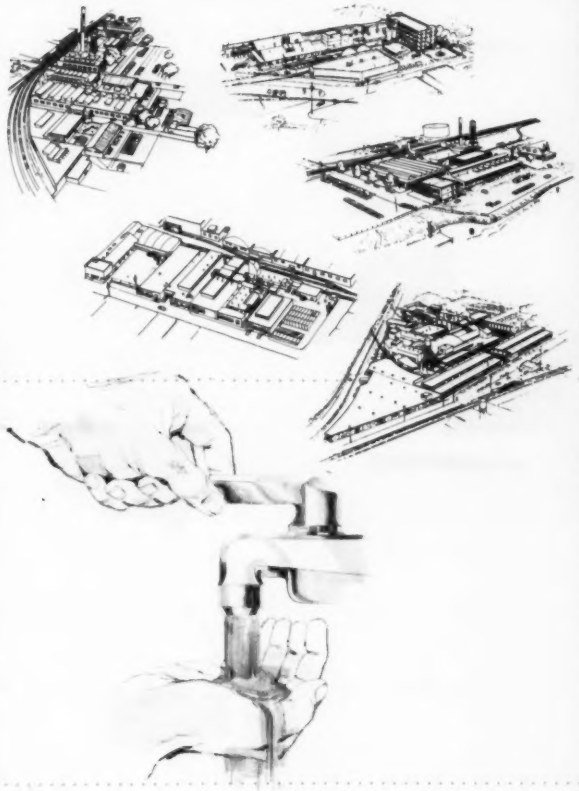
Founded in 1857, just one hundred years ago, Mueller Co. has grown steadily with the vital industries it serves.

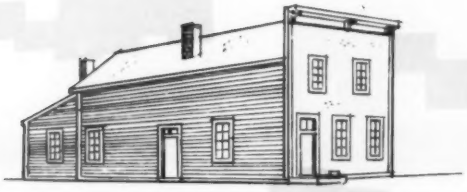
In 1857: Only one company in the United States was furnishing gas to its twenty-one customers; water sold for a penny a bucket from wagons; Hieronymus Mueller worked in a one-room, one-man shop in Decatur.

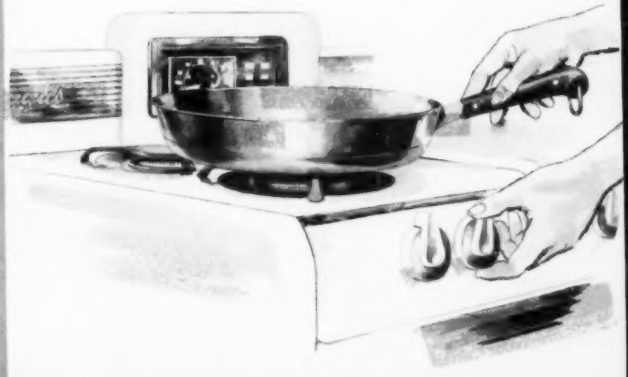
Today: Nearly 35 million Americans use gas for heating, cooking; more than 20,000 systems supply pure, fresh water to 130 million people; Mueller Co. is an organization with five modern factories, employing thousands of skilled craftsmen, manufacturing hundreds of quality products for water and gas distribution systems.

The water industry has made tremendous progress…the gas industry has had spectacular growth… Mueller Co. has kept pace with this march of progress!

1857 1957







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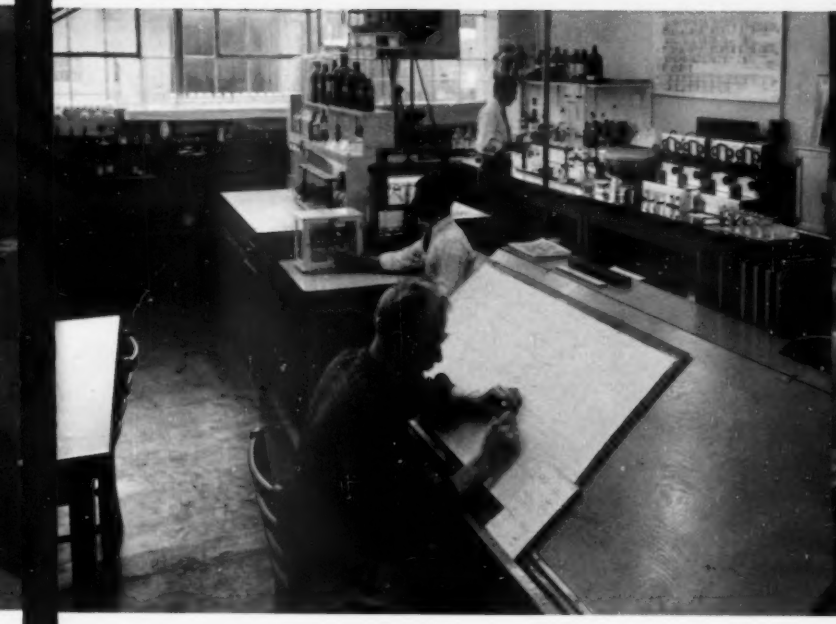
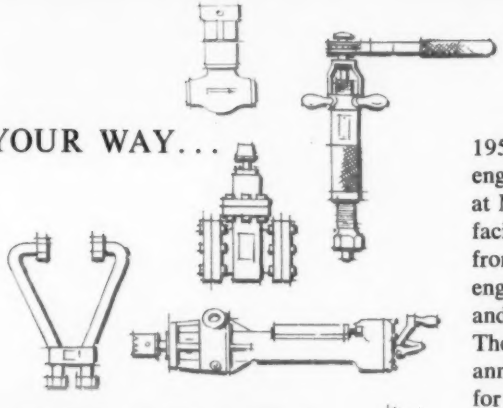


COMING YOUR WAY...



1957 was a year of spectacular engineering accomplishment at Mueller Co. New engineering facilities were dedicated and from the boards of an expanded engineering staff came new and improved products. These products will soon be announced, and will be ready for you in '58!

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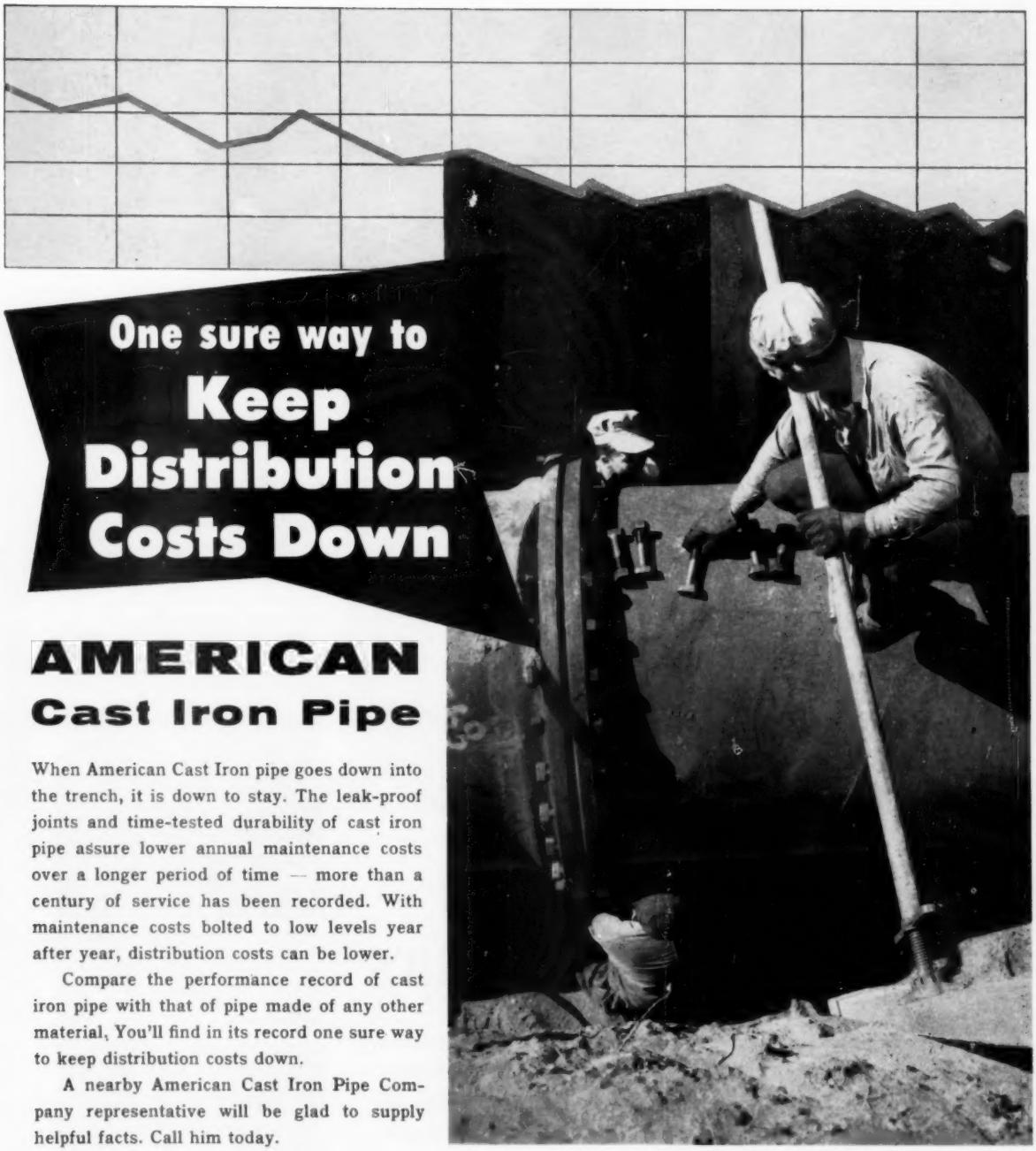

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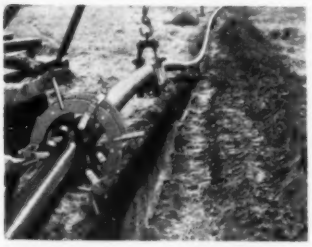

QUICK, easy application of "SCOTCHRAP" to long lines of welded pipe expedited by use of Betzel "Tapester." Permits continuous insulating with smooth, tight result.

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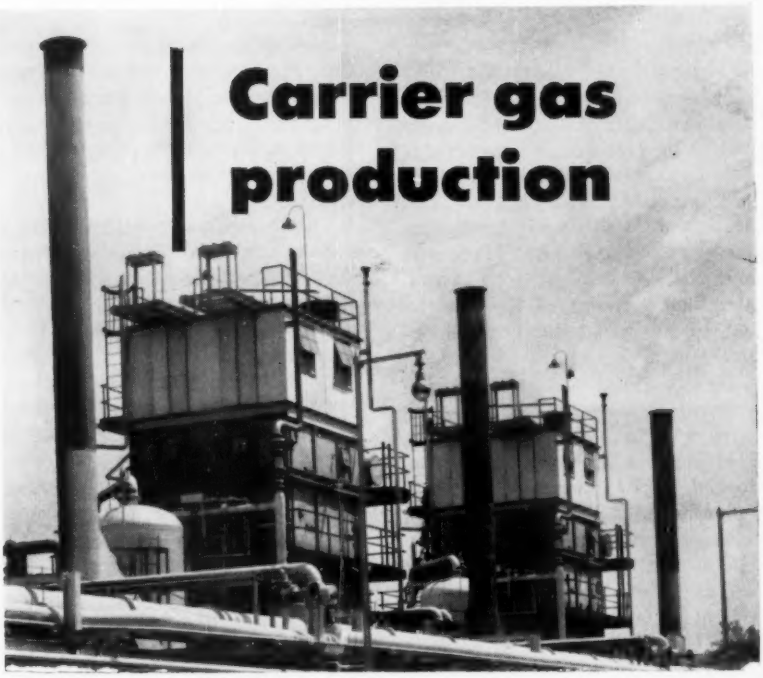
GAS
DECEMBER 1957

GAS exclusive



Carrier gas production

Eastern utility installs catalytic reforming units

By JOSEPH M. BARNES and ELLIS S. BERGEY
Philadelphia Electric Co.

WHEN World War II passed into history the Philadelphia Electric Co. faced a tremendous expansion program. The gas department was to feel the influx of natural gas and the huge new demands imposed on the production, transmission and distribution systems. The sendout gas at this time was 520 Btu per cubic foot and 0.450 specific gravity. With the advent of the new natural gas supply and its utilization, the sendout gas was raised to 801 Btu per cubic foot and 0.58 specific gravity.

In the 35-year period prior to Jan. 1, 1955, the Philadelphia Electric Co. had purchased the major portion of its base gas from a nearby coke plant. On Jan. 1, the contract for the purchase of this gas was terminated and another source of carrier gas had to be provided.

The gas engineering and production departments investigated all available carrier gas producing processes and the steam-hydrocarbon process was chosen on the basis of the investigation. The Girdler Co., Louisville, Ky., had supplied such plants for producing high-purity hydrogen from hydrocarbons and steam in a continuous, low pressure, catalytic reforming process; however, this process had never before been installed in a gas utility. The adaptation from the chemical industry to the utility field proved simple and rewarding. The hydrogen which we must maintain in our sendout gas was readily available from this process.

It also provided a versatility

which was needed in case of a natural gas interruption, since the steam-hydrocarbon process could also utilize other hydrocarbon feedstocks such as propane.

Through the farsighted planning and understanding of Philadelphia Electric Co., the carrier gas shift from coke oven gas to the hydrogen, carbon monoxide, and carbon dioxide of this new process went on unnoticed by our customers. The sendout gas is now comprised of 68.5 per cent natural gas, 30.5 per cent of the new reformed gas and 1 per cent diluent air.

Hydrocarbons react with steam over catalysts at elevated temperatures with the result that all the hydrocarbons are converted to hydrogen, carbon monoxide and carbon dioxide. The two principal reactions which interest the utility field using paraffin hydrocarbons are as follows:

(1) $C_n H (2n + 2) + n H_2O = n CO + (2n + 1) H_2$

(2) $C_n H (2n + 2) + 2n H_2O = n CO_2 + (3n + 1) H_2$

This second reaction is considered to be the summation of reaction (1) and: $n CO + n H_2O = n CO_2 + n H_2$.

Similar reactions occur with olefin hydrocarbons such as ethylene and propylene. These reactions are all endothermic and require that a constant source of heat be supplied to maintain the reaction temperature.

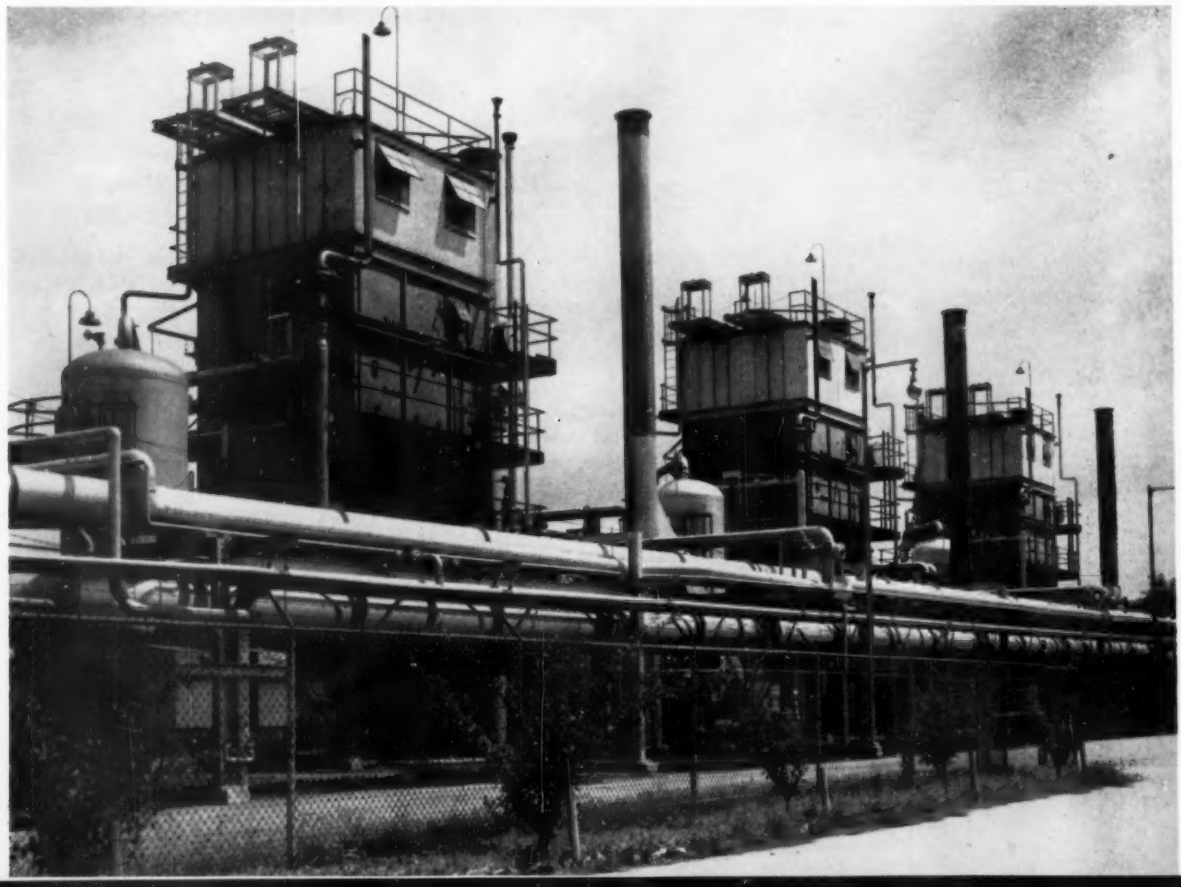
The three units installed at West Conshohocken are designed to produce 16.5 million standard cu ft of carrier gas daily when reforming natural gas, and 12 MMcf daily when using propane as the hydrocarbon feedstock. These design conditions are easily met and may be exceeded without any variation in the quality of the carrier gas.

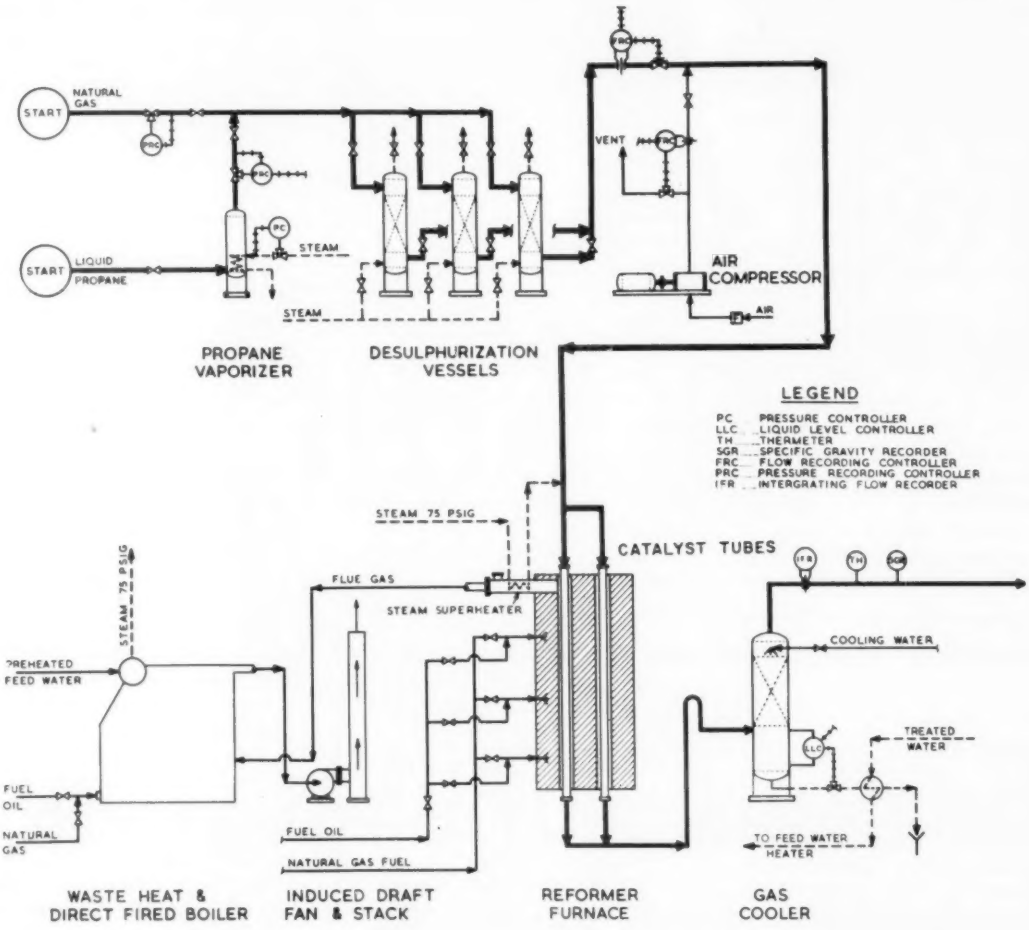
The reforming furnace is the largest component in the flow diagram of the Girdler train. The combustion chamber is divided vertically into four cells and completely refractory lined. Suspended in each cell are four austenitic stainless steel tubes completely filled with Girdler Reforming Catalyst, containing approximately 20 per cent nickel in the form of 0.75-in. cylindrical extrusions.

The feedstock, before entering the reforming tubes, is first passed through a desulfurization vessel. This vessel contains a bed of activated carbon which provides a means for the removal of organic sulfur compounds which must not reach the hot catalyst during the reforming operation. There are three vessels operated in parallel. Only two of these are required for the removal of sulfur which allows one vessel to be taken out of service and reactivated. This is done by passing steam through the carbon bed to atmosphere countercurrent to the flow of process gas. The time between reactivations varies with the sulfur content of the gas stream and the quantity of gas produced.

The sulfur-free gas stream from the desulfurization vessels is then mixed with a metered quantity of steam and air in a small mix chamber and introduced into the top of the reforming tubes. Here the reforming reactions take place and the feedstock is broken down into

Three continuous catalytic reforming units are in operation at PEC's West Conshohocken plant.





FLOW DIAGRAM FOR CONTINUOUS CATALYTIC REFORMING PROCESS

hydrogen, carbon monoxide, carbon dioxide, nitrogen and trace percentages of ethane and methane. The carrier gas thus produced passes from the tubes into Inconel or Incoloy manifolds and thence to a primary spray quench and a contact cooler. The gas stream is quenched to 180° F and cooled in the counter flow Raschig ring filled cooler to 100° F. The heating value of the reformed gas runs from 250-300 Btu per cu ft and specific gravities of 0.330-0.490, depending upon the furnace temperatures and the amounts of process air added to the stream. The gas feedstock having already been purified, the carrier gas is now metered and passed directly to the storage holder prior to pumping, high pressure enriching, and distribution.

The waste heat boiler has two auxiliary burners which are utilized when reforming LPG or when supplying steam to other plant facilities. The burners can be fired with either natural gas or fuel oil. They have safety protection on both systems using a flame scanner pickup. A flame failure in the boiler automatically closes the fuel solenoid valves. When the fault is cleared up and the pilot flames are relighted by spark ignition, the fuel solenoid valves can be relatched and the boiler returned to normal operation.

When reforming natural gas without process air, the minimum steam to gas mol ratio must be 2.0 to 1.0. The process air, when added, allows the ratio to be reduced to 1.5 to 1.0. Propane reforming necessitates a steam-to-LPG-mol ratio of 15.0 to 1.0 and it was hopefully anticipated that the addition of process air to this operation might lower this ratio. Air addition increases the carrier gas production and the overall efficiency but the high steam ratio is still required for successful and satisfactory operation.

The boiler feedwater is 100 per cent make up and the plant utilizes the river water which is adjacent to the station. The water is filtered through sand with the aid of coagulant feeders and then, using

a zeolite system of water softening, it passes from the filters through the softeners and a feedwater preheater to the deaerator and softened water storage. Purchased city water is also available and when processed, it bypasses the filters and flows directly to the sodium zeolite softeners. The boiler feedwater pumps take suction from the softened water storage tank and pump the water at 225 psig through a water level control valve into the boiler steam drum. The steam is generated at 120 psig, saturated and distributed to the plant system. The process steam is reduced by a pressure regulator to 75 psig, then metered and flow controlled by pneumatic meter and control system and passed on to the superheater.

The superheater is located in the reformer furnace outlet breeching and the superheat is obtained from the furnace flue gases before they reach the waste heat boiler. The steam temperature is kept between 950°F and 1000°F. High steam temperatures are necessary to obtain furnace efficiency and to insure no moisture coming into contact with the hot catalyst. The steam flows from this hairpin-type superheater to the process flow mix chamber prior to entering the catalyst tubes.

Steam is also available after the 75-psig reduction for auxiliary purposes, deaeration, carbon revivification, dehydrator drying, oil heating, space heating and flow line steam tracing. The latter system is reduced further to 35 psig for this service.

The process air is pumped by rotary compressors adequately equipped with dual filtration systems. This system uses one dry filtration in series with an oil bath type cleaner. The air thus handled is back pressure regulated, flow controlled, metered and delivered at 40 psig and 240°F to the process flow mix chamber.

The plant is instrumented with pneumatic recorders and controllers, which are used in conjunction with differential pressure transmitters or differential converters as the air transmitting devices. The flow control valves and pressure regulators are the diaphragm motor-operated type. Two 12-point temperature recorders per unit keep a running temperature log of the furnace wall temperatures and also the superheated steam and flue gas temperatures. A recording calorimeter and gravitometer make continuous recordings of the heating value and specific gravity of the carrier gas stream.

The individual Girdler trains are adequately covered with trouble detector circuits centralized at the panel boards. These detector circuits light dual lights and sound a horn when a pressure, flow or Btu disturbance causes such fault detection. When the operator silences the horn, one of the lights also goes off and the other remains lighted until the fault is cleared or eliminated.

The high degree of dependability along with the simplicity of process control enables the units to be operated by one man per unit per shift. It is possible for two men per shift to operate the three units when not cracking liquefied petroleum gases.

A change in carrier gas production rate takes approximately one-half hour and it requires the manual control of the furnace burners and the contact cooler cooling water, all other flow variations are made at the panel board. At such times and a minimum of twice each shift, an optical pyrometer reading of the tube temperatures and furnace walls is obtained and logged for ready reference.

The Philadelphia Electric Co. is well pleased with the adaption of the Girdler Process to the gas utility field. The ready and cooperative effort of The Girdler Co. has made the few problems which naturally arise in such operation easily surmountable. ■

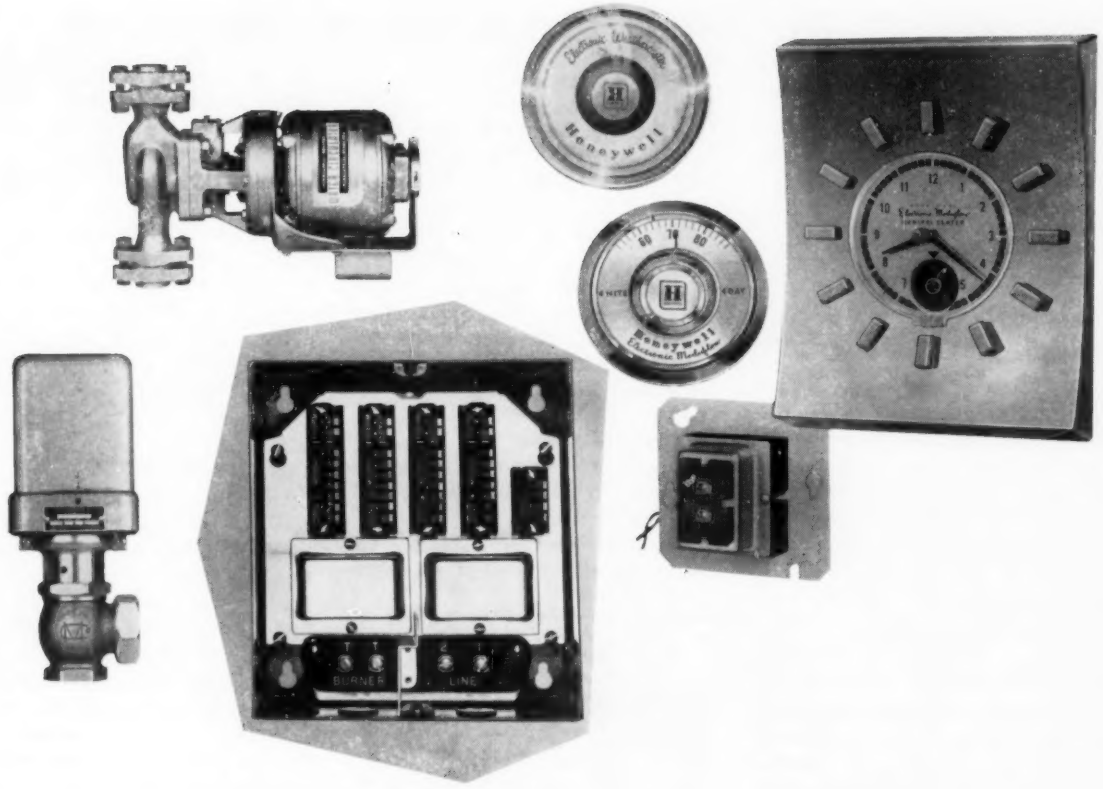
REPRESENTATIVE OPERATING RESULTS FOR A SINGLE UNIT

	Nat. Gas With Air	Nat. Gas Less Air	LPG Less Air
Heating Value			
Btu	257	361	291
Specific Gravity	0.470	0.351	0.401
Carrier Gas, Therms per Mcf Output	2.57	3.61	2.91
Natural Gas, Therms per Mcf Input			
Process Fuel, Input	2.351	2.970	2.440
Furnace Fuel, Input	0.850	1.543	2.212
Total Fuel Input	3.201	4.513	4.652
Thermal Efficiency			
Output, Per cent, of Fuel Therms Input	80.3%	80.0%	62.6%
Steam Consumption, lb/Mcf Output	15.3	29.8	65.7
Air, Cubic Feet per Mcf Output	239	—	—

REPRESENTATIVE GAS ANALYSES OF THE CARRIER GAS PRODUCED BY THREE REFORMING OPERATIONS

GIRDLER GAS ANALYSIS

	Nat. Gas With Air	Nat. Gas Less Air	LPG Less Air
CO_2	6.3	8.2	15.3
Ill	0.0	0.0	0.0
O_2	0.0	0.0	0.0
H_2	58.2	75.7	72.9
CO	14.8	13.9	9.9
CH_4	1.1	1.6	1.5
C_2H_6	0.0	0.0	0.0
N2	19.6	0.6	0.4
Rec. Btu	246	304	278
Calc. Btu	244	302	279
Rec. Sp. Gr.	.493	.347	.380
Calc. Sp. Gr.	.476	.327	.392



ZONE TEMPERATURE CONTROL...

What a serviceman should know about it

PART 3

This is the third and final installment on what residential zone temperature control is, and how it affects the serviceman. It summarizes the function of the controls used, and discusses in detail some control devices specially designed to operate in conjunction with other controls in the zone system. It also pinpoints the steps that a utilities serviceman might take in servicing a system equipped with zone control.

By LLOYD H. JOHNSON • Minneapolis-Honeywell Regulator Co.

THE purpose of this product information is to familiarize the serviceman with zone controls so that he can more easily recognize the nature of his service problem when he encounters a zoned system. Such product knowledge will enable him to evaluate whether corrective measures lie within his sphere of operation. Occasionally, where it is apparent that some minor adjustment can be made on the zone equipment which would eliminate complaints, the utilities serviceman would obviously be doing a good turn to make a repair. However, where problems involve parts of the system beyond the primary burner controls, it is generally best to advise the homeowner to contact the heating or air-conditioning dealer who installed the zone controls.

SOME OF THE CONTROL DEVICES USED IN ZONE SYSTEMS

Fig. 1. Outdoor reset control for establishing plenum temperature in correct relationship to outdoor temperature.

• *For central forced air systems*

Damper Actuator

In answer to the National Warm Air Heating and Air-Conditioning Association's constant air circulation (CAC) recommendations, the modulating damper operator shown in *Fig. 1* was developed. Previously, unless costly commercial type modulating motors were used, the central forced air system was regulated by two-position zone damper motors. The zone damper had to be 100 per cent open or 100 per cent closed. Under conditions where there was only slight demand, the zone damper would remain fully closed over a considerable period of time and air stratification would set in. This "on-off" damper operation interfered with constant air circulation. Consequently, residential zone control using two-position damper motors on central forced air systems was frowned upon in many segments of the industry.

The damper actuator shown in *Fig. 1* differs from the usual operator, in that there is no gear train or other complex mechanism built into the unit. It is completely silent, and it provides *modulating* damper operation—even though it is operated directly through a two-wire Series 80 (on-off) thermostatic control.

The damper actuator gets its movement through a relatively large coiled bimetal element, *Fig. 2*, similar to the bimetal in a room thermostat. When the zone thermostat which controls the damper actuator is calling for heat, electric heat is directly applied to the large bimetal coil in the actuator. The more heat that is applied, the greater is the expansion of the actuator's bimetal. "On" cycles, as established by the zone thermostat, result in an intermittent current flow into the actuator's bimetal. This bimetal is therefore alternately heated and cooled—causing it to expand or contact according to temperature requirements of the zone.

Thus, by gradual movement of the helical coil of bimetal, the shaft on the damper actuator is slowly rotated. This movement in turn positions the zone damper and also actuates auxiliary switching. Instead of the usual two-position operation, the zone damper "floats" slowly between the fully open and fully closed position. It results in a practically constant re-positioning or "re-balancing" of each zone according to load demand. Under normal conditions constant air circulation to each zone is assured.

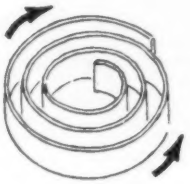
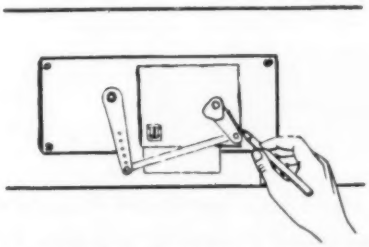


Fig. 2. Bimetal in damper actuator is capable of precisely positioning a zone damper. Expansion or contraction of bimetal is controlled by feeding electrical heat directly to the bimetal during each "on" cycle of thermostat. Inside end of coiled bimetal is attached to shaft which rotates as bimetal expands or contracts.

Outdoor reset control

In order that maximum air circulation be continued throughout the heating operation of a central forced air zone rebalancing system, outdoor reset control is highly important when three or more zones are involved.

An outdoor reset control (*Fig. 3*) is designed to operate the burner according to outdoor temperature. It has two remote temperature-sensing bulbs. One is mounted outdoors to measure outside temperatures, the other bulb, mounted in the plenum, senses discharge air temperature. Plenum temperature is *reset* in keeping with the greater or lesser heating load, as indicated by outdoor temperature. This assures a progressively higher plenum temperature as it becomes



HOW TO CHECK DAMPER ACTUATOR FOR PROPER OPERATION

The damper actuator (and mounting plate) shown here is installed on a zone duct. Note how linkage connects actuator to shaft of the zone damper. To test the action of the damper actuator, raise the temperature setting of the zone thermostat which controls it. A four- to six-degree rise in temperature setting is sufficient. Next, place a piece of tape or make a pencil mark on the cover of the actuator, indicating the position of the damper linkage. After a 10- to 20-minute interval you should note a definite change in position of the damper linkage. After making this check, return thermostat to its original point.

Fig. 3. Outdoor reset control for establishing plenum temperature in correct relationship to outdoor temperature. Automatically raises setting for plenum 1° for every degree drop in outdoor temperature.

colder outside. In milder weather, the possibility of overheating is eliminated, because plenum temperature is reduced.

On central forced air systems using a Honeywell modulating M829A damper actuator on each zone volume damper, the Honeywell T835A outdoor reset control is used. The T835A resets plenum temperature at a ratio of 1 to 1. For each one-degree temperature drop measured by the outdoor sensing bulb, furnace plenum temperature is raised one degree. However, where internal heat gains or solar effects might cause zones to call for little or no heat during a period when outside temperature is dropping, it would be undesirable to raise plenum temperature. To prevent such occurrences, each zone damper actuator has a means of influencing the final set point of the T835A outdoor reset control. A potentiometer in each damper actuator is interconnected to a heater element in the outdoor reset control. As the various damper actuators move toward the closed position, the amount of false heat is applied to the outdoor reset control, thus lowering the plenum temperature.

By depressing plenum temperatures in this manner when the majority of zones are nearly satisfied, zone dampers can remain more constantly in the open position. This assures a more continuous air circulation to all zones, regardless of heating load.

When the mixed air method of zone control is used, the Honeywell TA418A outdoor reset control is used. This device is similar to the T835A, except that it has no internal heater, and it established its control point only in a direct ratio relationship to outside temperature since the volume of air delivered to each zone is constant.

Multiple zone connection panel

This panel (*Fig. 4*) provides a neat, convenient method of interconnecting the wires used in a modulating warm air zone temperature control system, and also provides the low-voltage power source for the circuit.

The built-in transformers provide power for the T835A damper actuators, depending upon the model ordered.

The W216A1 is designed for use on a two-zone two-actuator system, and the W216A2 is designed to be

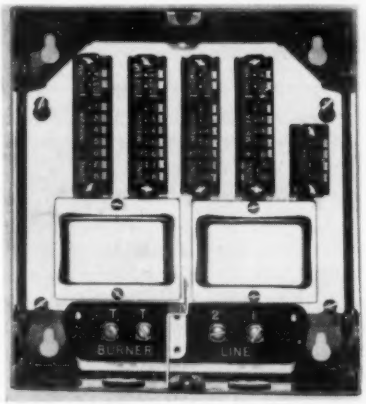


Fig. 4. Multiple zone panel provides transformers and connections for large hook-up of zone systems. Model shown will handle three or four zone systems.

used with either a three- or four-zone system.

The panels include one 24-v transformer for each two zones in the system, and one quick-connect terminal block for each zone, to provide connections to the zone thermostat and damper actuator. One quick-connect terminal block is provided for connecting the outdoor reset control into the zone control system.

All components are mounted on a sub-panel which may be easily removed from the case for installation or servicing.

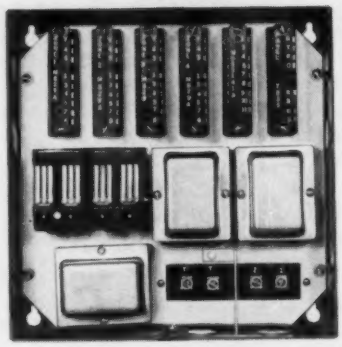


Fig. 5. Heating-cooling zone panel includes necessary switches, transformer, and wiring connections for installation of zoned heating-cooling systems. Panel shown is for three- or four-zone modulated air volume systems.

● *Heating-cooling panels*

Three types of heating-cooling panels are available for zone control systems. They are: W407A, for single actuator, two-zone system; W407B for two-zone modulating air volume control installations; and W407C for three- or four-zone modulating air volume control installations (*Fig. 5*).

Heating-cooling system switch

This switch is designed for use

Fig. 6. Heating-cooling system switch for manual changeover from heating to cooling cycle, or for manual operation of ventilation.

with Honeywell's heating - cooling systems (*Fig. 6*). It is equipped with switches for manual selection of automatic heating or cooling system operation, or for total shutdown of the system. Another switch is for fan operation.

The switch is normally mounted near the thermostat, or at whatever other location is convenient for the homeowner's use.

Hot water systems

If domestic water supply is furnished from the boiler, the burner is operated by an Aquastat which maintains a constant boiler water temperature. Where domestic hot water is not supplied by the system, the burner should be operated by an indoor-outdoor reset control similar to the device used with central forced air zone systems. For forced hot water applications, Honeywell uses the TA418A outdoor reset control. Such a device includes two remote temperature sensing bulbs. One bulb mounts outside the house, and measures outdoor temperature. The other bulb is immersion-mounted in the boiler. It measures boiler water temperature.

The outdoor reset control operates the burner according to load demand, as indicated by outdoor temperature. As outdoor temperature drops, control point of the device is automatically raised in direct ratio. Thus, boiler water temperature is automatically increased as outdoor temperature drops, and is lessened as outdoor temperature rises. Boiler water is always of adequate temperature to satisfy demand. The possibility of over-heating in milder weather is eliminated because lower boiler water temperatures are maintained.

● *Zone valve*

The Honeywell V2008A is a two-position, low-voltage electric motorized valve (*Fig. 7*). It is a versatile dependable valve that is widely used on forced hot water and two-pipe steam systems—especially in residential work, where zones are generally small.

The V2008A is made in a straight-through and angle-type single-seated brass body. The valve can be operated with a Series 20 low-voltage zone thermostat. Where two-wire low-voltage (Series 80) control is used, this valve is operated through an R183B relay.

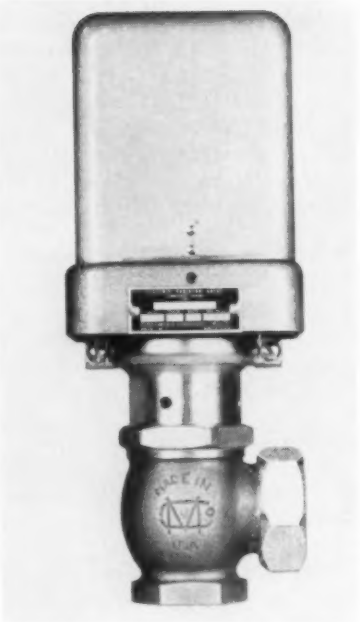


Fig. 7. Zone control valve for hot water or steam gives two position control of flow to zone according to demands of zone thermostat.

A small induction motor with a 60-second travel, drives a quiet gear train, supplying positive, dependable two-position control. A special key is provided for manual operation of the valve when desired. This permits hand positioning of valves in the event of power interruption. Upon resumption of power, the valve automatically returns to the command of the zone thermostat. The head of this unit can easily be removed for servicing, without disturbing the valve body or stem.

A convenient indicator on the side of the power head reads "open" or "closed" to show valve position.

An auxiliary switch (SPDT) is included with the valve motor operator. This switch can be used to provide auxiliary control by actuating another Series 20 valve or motor, or a line voltage switching relay. For example, the auxiliary switch might control a relay to operate the circulator in a forced hot water system. On steam systems, the auxiliary switch in the zone valve is normally used to transfer burner control from the low-limit Aquastat to the Pressuretrol, depending upon whether there is a call for heat in any of the zones.

Where the boiler supplies domestic hot water, the auxiliary switches on all zone valves are interconnected, and can independently operate the circulator and burner through an R832A relay. This enables any zone to start the circulator upon a call for heat, and also to start the burner if desired. The low-limit Aquastat, L6006A (or L6010A triple Aquastat) operates the burner to maintain minimum boiler water temperature. The low-limit control in this device will not permit circulator operation until the boiler water is at or above the minimum temperature control point.

● *Water circulator*

A circulator of the type illustrated in *Fig. 8* is used on hot water systems to provide forced circulation on each individual zone or on applications where a single circulator is provided, to circulate water to the entire system whenever any zone valve is calling for heat. Such a pump assures prompt, dependable distribution throughout the hot water system. Yet, the flow of hot water is instantly stopped when heat is no longer required, so that over-heating is prevented.

Most AC single phase model circulators and other types of pumps are equipped with a recycling overload cutout, which protects the

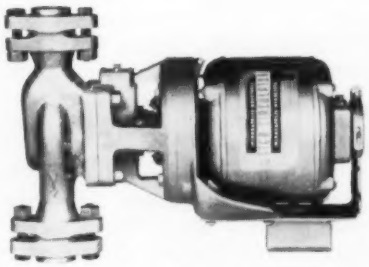


Fig. 8. Water circulator used for circulating hot water for entire system when zone valves are used. It also may be used on each zone to start or stop flow according to zone demands.

motor from damage should a dead stall be caused by foreign matter in the pump impeller. The thermal overload cutout also protects the motor from overheating due to lack of lubrication.

Where a single circulator is used, it is installed in a common return, near the boiler. Each branch return should have a balancing cock (upstream of the circulator) to permit restricting the flow in zones which are smaller or closer to the boiler. Where a circulator is used for each zone, it is mounted in each of the zone return lines.

Because the comfort requirements of occupants vary, and installer's recommendations might differ, a wide range of thermostatic control can be found on zone systems, just as on any other type of installations.

By using a low-voltage thermostatic control that is sufficiently responsive, and designed to provide fully automatic temperature regulation in keeping with comfort requirements, the advantages of zone re-balancing are best assured. The recommendations of the control manufacturer should be closely followed in order that inter-related control devices are compatible to one another, in working in the system. If a Series 80 thermostat is used, for example, it cannot control directly a line-voltage zone circulator or a Series 20 zone valve—except through an intermediate relay as recommended by the control manufacturer. Even a thermostat of the proper series circuitry might not function properly in a mixed control system due to possible differences in thermostat heater resistance.

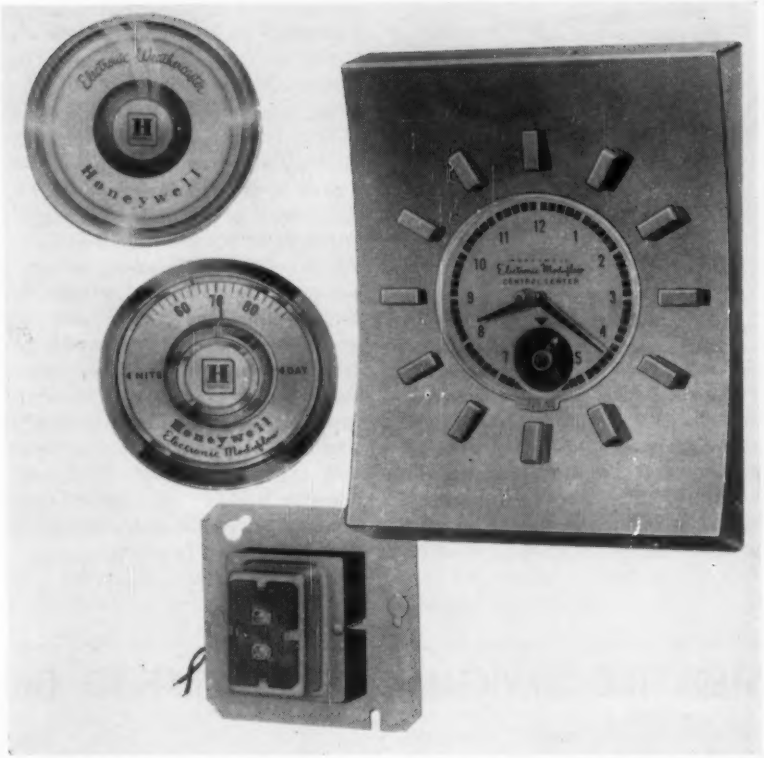


Fig. 9. Electronic moduflow control system consists of decorator wall clock type relay (which serves as decorative timepiece and electronic amplifier-relay for the system, plus timing mechanism for day-night control); also outdoor thermostat (upper left), indoor thermostat (middle left), and low voltage clock transformer (lower left).

- *Electronic control*

An electronic control system (*Fig. 9*) with its rapid responsiveness and compensating outdoor control enjoys increasingly wider acceptance—both for single unit control and for the main living areas in zone control. Electronic systems are adaptable to both heating or cooling. Its temperature-sensing controls are exceptionally responsive, and the system never requires a perceptible drop or rise in room temperature before there is a call for heating or cooling. In addition to the room thermostat, an outdoor compensating control influences indoor temperature according to load conditions. Several types of electronic control systems are available with manual or automatic day-night temperature control and also a special model for floor panel heating applications.

Fig. 10. Compact new round model thermostat combines temperature selector and temperature scale in one easy-to-read dial. Mercury switching assures dust-free contact operation.

Series 80 controls employ the conventional two-wire, low-voltage control circuit. Series 20 controls (*Fig. 10*) use a three-wire, low-voltage control circuit. Most thermostats of this type have a heat-leveling feature, which permits closer controlling of heating (or cooling) cycles. A number of models have adjustable heaters, which provide a means of varying the cycling characteristics in accordance with requirements of different control devices. For example, a thermostat operating with a zone valve or damper actuator, requires a certain heater setting as recommended by the control manufacturer. Some thermostats are electrically phased to operate with specific control devices. It is therefore advisable to use an entire zone control system as recommended by the manufacturer, rather than to improvise, or mix controls.

Series 80 thermostats can op-

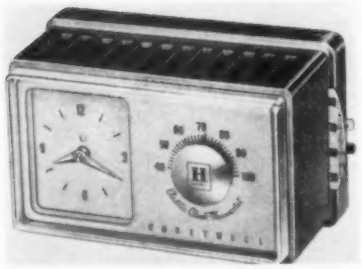


Fig. 11. Electric clock thermostat provides timing mechanism for fully automatic night set-back and morning pick-up.

erate a Series 80 zone damper actuator directly, or a zone valve or circulator through a relay. Series 20 thermostats can operate a Series 2 zone valve directly. When a thermostat is to operate a zone valve or circulator, it is essential that the control manufacturer's system sheets be followed to insure desired operating cycles and switching action.

In considering a zone control job, it is important to specify the type of thermostatic control best suited to the needs of the zone, and also to the needs of the occupants. An electric clock thermostat (*Fig. 11*) should be included in zones where it is desirable to have the fully automatic comfort and convenience of separate day and night temperatures. Where more flexible day-night temperature schedules are expected, a semi-automatic day-night thermostat can be specified (*Fig. 12*). Such a thermostat incorporated a mechanical timer for manually setting the automatic pick-up time.

Fig. 12. New style round thermostat incorporates mechanical timer which permits manual night set-back and automatic morning pick-up. Mechanism can be set for any interval of temperature set-back, up to 10 hours.

STEPS THE SERVICEMAN SHOULD TAKE TO CHECK-OUT A ZONE SYSTEM

1. Check operation of the heating plant

a. Does burner operate?
b. Determine what control device directly controls burner. (Outdoor reset control, operating Aquastat, etc.,)
c. Is controlling device operative so that it automatically starts and stops burner?
d. If burner control is inoperative, check for defect in the same manner that is recommended for servicing any other type of system.

(Note: This is normally as far as the utilities serviceman needs to go. The zone control portion as well as cooling equipment in a system is normally serviced by the heating or air-conditioning dealer who installed it.)

2. Isolate individual zone control systems

In addition to the basic core of the control system, consisting of a burner control, primary and limit controls, each zone has its own separate control system. A zone thermostat controls an "operator" (damper actuator, motorized valve, or circulator), which mechanically regulates passage of the heating medium to the zone.

Each zone, valve, pump, or motor should be tagged or labeled so that a serviceman can easily recognize in what portion of a system each device functions. Information should also include which thermostat controls the device.

3. Determine what switching device transfers burner authority from one zone to another zone

These are usually auxiliary switches, built into the control valve or damper actuator that permit it to operate the burner whenever it is near the open position. On wet heat system, an external relay is used to operate both the circulator and burner if desired, whenever any zone valve is near the open position. If a zone system with automatic day-night control uses an outdoor reset control to operate the burner, switching is provided to transfer authority to the high-limit control during the morning pickup interval.

When a zone system is installed according to the control manufacturer's instructions, it should not require any more attention than any other similar heating or cooling jobs using a single thermostat. In actual practice, a properly installed zone system greatly reduces complaints and service calls because of improved comfort conditions. The responsible control manufacturer cannot afford the risk of marketing faulty or untried control devices—either for zoning, or any other application. The better known brands of controls carry the usual one-year guarantee, and the devices themselves are engineered and tested to perform properly through a minimum 10-year life span. With the more than 20 years background in commercial applications of zone control, plus the tens of thousands of residential installations with from five to ten years of successful operation, today's heating or air-conditioning dealer can recommend such equipment with confidence.

Zone control is never a substitute for a well engineered system. Experience has shown that some omission or over-sight in the installation are frequently the basic cause for service calls. For example, improper sizing, layout, or balancing of the duct system can cause inequities of distribution that zone controls themselves cannot overcome. Similarly, a zone

damper improperly fabricated or installed, can throw zone operation all off. It is advisable to purchase a prefabricated kit consisting of a zone damper (which can be cut to proper length), shaft, linkage, and mounting plate (for duct-mounting of damper actuator). With such a kit, all parts can be assembled in their proper relationship, and valuable time is saved in installation. This also minimizes the possibility of dampers, linkages or shafts binding as a result of improper fit or adjustment.

Wet heat applications also require sound principles of piping layout and should provide adequate flow valves, balancing cocks, and vents.

Faulty wiring, or jumbled hook-ups that are difficult to check-out are also the cause of frequent servicing problems. Control panels specially engineered by the manufacturer to function with specific zone applications are helpful to both the installer and the serviceman. For central forced air heating and heating-cooling applications, Honeywell has a number of special panels for its zone re-balancing systems. The number of panels used depend upon how many zones in the system. These panels provide neat, convenient terminals for wiring, and incorporate transformers and interlocking relays for a well-integrated system.

Whenever an installation indicates temperature control problems beyond the limitations of a basic control system, it is advisable that the heating or air-conditioning dealer take advantage of a wholesaler's consulting service, or call in a control manufacturer's representative. This situation should normally not affect the utilities serviceman, because the most practical time to consider zoning is while the job is in the early planning stages. Occasionally, where the utilities man finds instances where zoning would benefit an existing job, he should suggest that the homeowner ask his heating or air-conditioning dealer about the advisability of making changes in the system. Where a utilities service department desires to keep its staff informed on zone control and other associated equipment, the control manufacturer or other suppliers should be invited to present the zone control story to their men. These application engineers, with their broad experience with all types of installations and equipment, are in a position to present an interesting and informative meeting. ■

Lone Star backs package gas kitchens

Lone Star Gas Co. has taken steps to become the first utility to conduct active sales and promotion of a packaged kitchen unit featuring all-gas equipment. The new Mayfair Matchless All-Gas Kitchen was given its first public showing by Lone Star at the recent Texas State Fair in Dallas (see photo).

This showing marked the first move by the gas industry in a load-building program aimed at grabbing a large share of the packaged kitchen market for new and remodeled homes. Many call this the biggest potential load within reach of gas utilities.

The new Mayfair kitchen is fully competitive with the package units offered by the large electrical manufacturers. In fact, it could be called more competitive than most since a complete all-gas kitchen will be available in a lower price range than the electric packages.

Lone Star's promotional program consists of a cooperative advertising campaign with Mayfair and appliance manufacturers. In addition, the company will show the kitchens in its showrooms; use them in its auditoriums (30 of which either exist or are in planning stages); make promotional material available in its 101 sales floors; exihibit at fairs, homeshows, etc.; supply architects and builders with new developments; provide financial assistance to dealers and buyers; and offer kitchen design service.

Lone Star will begin its program by setting up dealers to handle the kitchens, with the utility's principal task that of promoting kitchen sales.

Appliances used in the Mayfair kitchens will be chosen on the basis of quality and national acceptance. These appliances will consist of a line of nationally advertised free-standing and built-in gas ranges and ovens, disposal units, dishwashers, automatic clothes washers and gas dryers, countertop built-in food mixing units, and gas incinerators.

Only those appliances whose manufacturers agree to promote these all-gas kitchens will be chosen as standard equipment, giving a combined industry-wide promotion program for consumer advertising and promotion.

Mayfair kitchens are made by the Mayfair Cabinet Corp. of Fort Worth and Mineral Wells, Texas.

GAS exclusive

BELL-PROVING TECHNIQUES

and how to

- set up the prover
- balance
- bottle in and out
- and strap

By WALTER G. PIFER
Rockwell Manufacturing Co., Pittsburgh

GENERALLY speaking, the gas meters which are built today are constructed with more accuracy than we can possibly prove them. For this reason, it is of prime importance that proving room conditions and the proving machine itself be maintained as closely as possible to a standard set of conditions.

While use of bell provers in meter test shops is almost universal, the accuracy obtained is not always the highest possible. Particularly is this true when the proving process is taken for granted. Several precautions must be taken when using a bell prover. It should not be used in a location where it is subject to rapid temperature changes. A variation of 5° in the air, oil or meter will affect the proof of the meter approximately 1 per cent. The prover must be set level, with the bell properly balanced to move freely and positively in all directions.

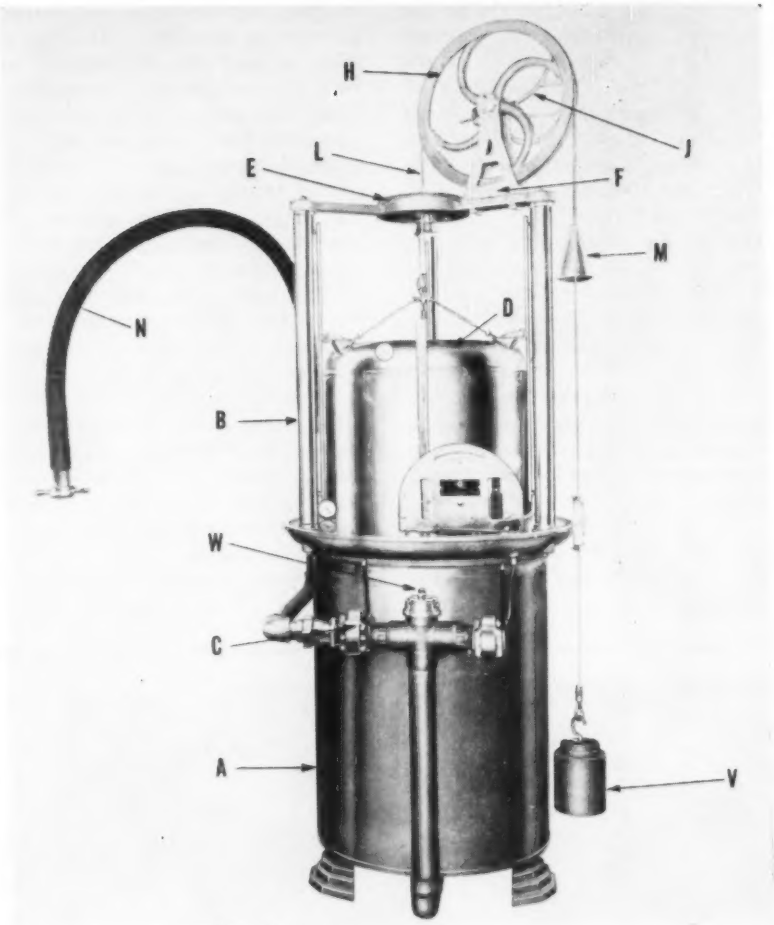


Fig. 1. Five-foot bell prover.

Setting the prover and the meter at the start of the test must be done accurately. The meter must be stopped accurately and the prover read accurately. A prover of sufficient capacity must be used to assure the same pressure in the measuring chamber at both high flow rates and low check rates. A pressure loss of 2 in. between prover and meter causes ½ per cent error in proving.

By definition, a bell prover is a gasometer or small liquid sealed gas holder used to measure air in small meter testing; its scale and

pointer are so arranged that the volume of air expelled between two positions of the bell can be read. The air is expelled by the action of gravity on the bell.

The pressure exerted on the air is obtained by a system of counterpoise weights. The pressure is kept constant for different degrees of immersion of the bell by a small counterpoise weight suspended from the end of an involute wheel. This pressure is usually 1.5 in. of water for the 5- and 10-ft provers, the two standard sizes.

Fig. 1 shows a standard 5-ft bell prover. To set up the prover, the body (A) should be set in the proposed location, on a firm level foundation. Lift the bell (D) out of the body (A) and make sure that the annular space in the body is clean; then replace bell (D).

Screw columns (B) onto the studs on top flange of body (A). Screw down to a firm bearing having the guide rod pointed to the center of the bell (D). It will be noted that the columns are numbered and located by means of dowel pins.

Remove the nuts from studs on top of the columns and place in position the three-armed spider (E), with the arm with the upright stands (F) resting on the right hand column.

Place the cable (L) over the wheel (H) down through the center of the spider (E) and attach to ring in bell (D). Turn wheel until cable pin fits into the hole in the wheel.

Place the cord on counter weight (M) over the involute (J) fastening cord through the hole at point of involute.

Attach the bent hose swivel (N) to the valve (C), having the hose vertical and adjust the hose saddle under the hose, suspending saddle from the ceiling.

Fill the annular space of the body (A) to about an inch from the top with approximately 35 gal. of liquid, and the prover is ready for use. As a sealing liquid, use meter sealing liquid or some similar oil, as oil prevents rusting of the prover, evaporates less quickly and does not change its temperature as quickly as water.

The prover must be set correctly as previously described, having all connections tight. Then the weights may be added and the prover calibrated.

After calibrating remove all weights added, leaving (M) and (V) as received with the prover.

To balance the prover, determine the approximate positions of bell for 0 ft and 5½ ft, and make sure that the cable pin fastened to the wheel never rides below the horizontal center line of wheel at these extreme positions.

With the bell at 5½ ft, position the involute so that the involute weight will hang approximately 2 in. from the shaft center.

Remove cable from wheel, and weight from involute, and allow the shaft to come to rest. Mark the position of the lowest point of the wheel with a chalk line. This represents the line of action of the center of gravity of the unit.

Remove the involute; slip counterweight assembly on shaft; and replace involute. The flat on the end of the shaft will reposition the involute.

Locate counterweights directly opposite (180° away) from the chalk mark on the wheel. Lock adjusting weights in position on stem about 3⅝ in. from shaft center. Adjust these weights together, in or out, until the unit is brought into static balance. Static balance is obtained when the unit will remain in any position in which it is placed. It is important that the friction be reduced to a minimum. Therefore, care should be taken to align bearings accurately.

Starting with counterweights in top position and rotating the wheel slowly in either direction, the weights should be moved *in* toward the center if there is a tendency for rotation to continue in the same direction as the wheel is being moved. If the tendency is for the wheel to return to the starting position, then the weights should be moved *out* from the center.

If the chalk mark is slightly off, as it may be, due to friction, and also, if the counterweight is not located exactly opposite the chalk mark, it may be necessary to rotate the counterweight slightly

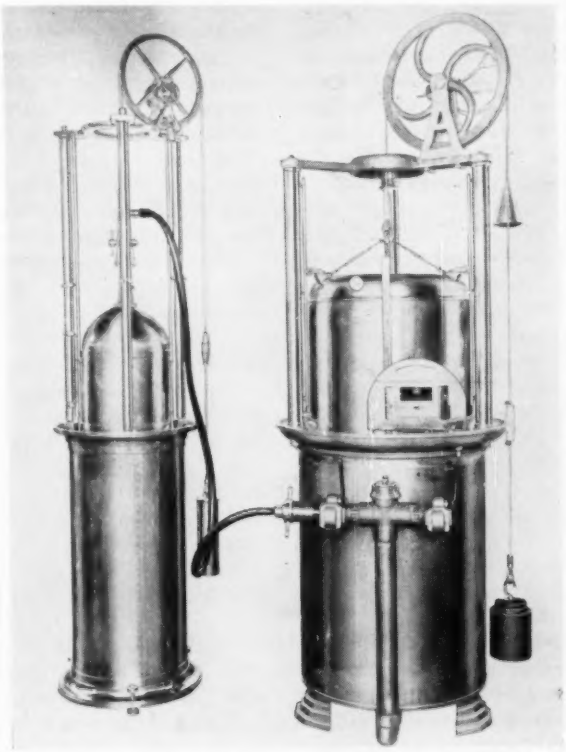


Fig. 2. Calibrating bell prover with standard 1-ft bottle.

Bell-proving . . . Proving process must not be taken for granted

with respect to the wheel in order to bring the unit into static balance.

With the unit balanced, the cable can be replaced over the wheel. The involute weight, loaded with BB shot so that its total weight is approximately 57 oz., can be hung from the involute.

With the bell at 5½ ft, and the liquid level ¼ in. below the bottom edge of the start of the flare on the top ring casting, adjust weights on cable to balance the prover.

Bottling—calibrating the prover by the use of a standard cubic foot bottle—should be done regularly to check and maintain prover accuracy (see *Fig 2*).

Temperature of all apparatus, air and room should be within 1° F and constant for the bottling period. The air used should also be saturated if testing with water. If these conditions cannot be met, the results must be judged accordingly.

With good air - conditioning equipment it is possible to hold temperature at floor and ceiling level within 2°, at least for a sufficient length of time to calibrate even a large prover. When bottling a small prover with the bottle at the same height as the bell, temperature variations due to differences in level may be disregarded.

Oil may be used in the prover, thus eliminating the cooling effect of evaporation and preventing the picking up of moisture and to a great extent the losing of it.

Oil may also be used in the bottle. A light oil must be used in order to prevent too heavy a film forming on the bottle and thus reducing the volume displaced. Water should not be used in the bottle again, however, until the bottle is thoroughly cleaned. If water is used in the bottle in an unsaturated atmosphere, it will be well to dry the outside of the bottle carefully before submerging to eliminate the chances of cooling due to evaporation.

Before bottling, the prover should be balanced as described earlier in this section. After balancing:

1. Attach the outlet of the cubic foot bottle by a small hose to the outlet of the prover.

2. With the cubic foot bottle submerged and all valves leading to atmosphere closed on the prover and bottle, remove enough weights from the prover counterweight to throw at least 1-in. pressure on the air in the prover. Open all valves leading from prover to bottle and watch prover bell for drop due to leakage. At the same time soap suds all joints, valves, and any points where leakage might occur. Replace the weights after this test.

3. Check the temperature of liquid in bottle, air in prover bell, oil in prover and room at bell level. If these are all within 1° F, a satisfactory test should be obtained.

4. Close the valve between the bottle and the prover. Set the prover pointer on the first foot mark on the scale with the bell down. The bell should remain at this position with the air valve open, and with the air valve closed the slope gauge should read zero pressure. If slope gauge is not available, use gauge on prover.

5. Check the liquid level in the bottle tank. When the bottle is resting on the bottom of the tank and the air valve is open, the liquid level inside and outside the bottle should be even with the mark on the gauge glass in the upper neck of the bottle.

Raise the bottle out of the liquid with the air valve open so that the bottle fills with air as the liquid drains out. After the bottle has completely drained, close the air valve. The bottle then holds 1 cu ft of air at atmospheric pressure.

6. Lower the bottle until the lower neck is sealed by the liquid. This is not necessary if no pressure exists on the air in the prover. However, it is a precaution which may prove worthwhile.

7. Open the valve between the bottle and prover and allow the air to be pushed out of the bottle by the liquid rising on the inside as the bottle sinks slowly. As the bottle approaches complete submersion, retard its drop so that no air is trapped in the bottle. This retardation of the bottle travel is important. Once the pressure has equalized between the bottle and prover, the liquid level will rise on the inside of the gauge glass to the mark and the slope gauge will read zero on the prover. A prover which apparently was in balance may show a slight unbalance when checked closely with a slope gauge at this point. The pressure must be brought to zero in the prover and bottle to insure the correct checking of each foot mark.

8. After the pressure has been equalized, the valve between the prover and the bottle should be closed. The scale should then be checked, marked or measured.

A new scale may be marked directly or a measurement taken on a temporary rule, in inches. In checking, a scale may be checked directly or indirectly by measurement on a rule in inches.

Regardless of the method used, the final scale markings must bear the same relation to the bell and pointer as the scale used in calibrating and also to the oil level inside the bell.

9. Repeat the operations of transferring 1 cu ft of air at a time from the bottle to the prover until the entire scale has been checked, allowing the error, if any, to accumulate to the last foot. In this way a more accurate check may be made and the picture as a whole will show up more clearly. Tolerances allowed in most states are plus or minus ¼ per cent. However, it is not advisable to change a prover scale unless test conditions are sure to have been very close to ideal. If there is any variation over the allowable limits, check all equipment carefully and endeavor to determine the cause of the error. Remove the cause rather than change the scale calibration. Recheck the test carefully to be sure some oversight has not occurred. Each scale is calibrated to each individual prover and is not interchangeable.

Bottling out with a bottle is

more difficult because there is no assurance the pressure in the bottle and prover are at atmospheric pressure as the liquid seal is about to break at the bottom bottle neck. One thing which makes this method even more difficult is the poor visibility of the lower neck of the bottle.

1. Completely submerge the bottle with the air valve open so that the water comes to the level of the gauge glass mark both inside and outside the bottle.

2. Raise the prover bell to the top so that the pointer is on the last foot mark on the scale when the pressure inside is zero.

3. Close the air valve on the bottle and prover and open the passage between the bottle and prover.

4. Raise the bottle very slowly so that the air may pass from the prover to the bottle as the liquid drains from the bottle. Be very careful that the seal is not broken at the bottom of the bottle neck until the pressures have equalized. At zero pressure in the bottle and prover, the valve between the two is closed.

5. Mark, check or measure scale as in bottling in and repeat for each foot.

Theoretically there should be no difference between bottling in and out of a prover. Actually, results will not check exactly. Many small factors which cannot be removed play a part in this difference, which should never be over ¼ of 1 per cent.

It is possible to calibrate or check a prover by finding its cubical contents by physical measurement.

As the bell is lowered the oil rises so that both the lowering of the bell and the raising of the oil level must be considered.

The average circumference may be found by use of a steel tape. Fit the tape nicely around the bell and take an average of six or eight measurements at equal intervals up and down the bell. From this dimension and the thickness of the bell copper, the area of the shell opening is found. This area multiplied by the length of the scale gives the volume of the bell. In addition to this volume, however, the oil level raises, displacing more air. To determine this volume easily and accurately, raise the bell to zero marking and measure the oil level, lower bell to the last foot scale marking and measure the change in level. Drain out the oil to the original marking. Measure the volume of the oil drained and add half this amount to the volume shown by the bell measurements. It has been assumed the volume of oil between the bell and inner tank is the same as that between the bell and outer tank. To be more accurate the exact amount in the outer section could be figured. This figure subtracted from the oil drained would give the rise in the bell to be added to bell volume between markings.

In addition to the precautions listed earlier, a few other general considerations bear mention.

Temperature variation is more noticeable on the proof for check rate of flow, since the air is given a longer period to acquire the temperature of the prover or meter. It is therefore important that meters remain in the proving room at the same height of the prover bell for a period of eight hours, and preferably longer. It is also important that the temperature of the proving room does not vary to any marked degree over this period.

It is practical to use a light oil as a seal in a prover to eliminate evaporation which causes temperature variations. However, it must be noted that oil clinging to the sides of the bell, especially on large provers, at times may affect the proof a small amount if it is not allowed to drain off before a test is run. This, of course, depends on the viscosity of the oil at the temperature being used.

In order to test a meter within the ranges of its capacity, it is necessary to employ restrictions on the outlet of the meter to control the amount of air. Test runs on unrestricted outlets are not recommended for accurate proofs. It is most desirable to test a domestic meter at or near its rated capacity at 0.5 in. w. c. differential and at a second flow of approximately one-fifth the rate capacity of the meter. It has been shown that domestic meters operate between the capacity flow and the above mentioned check flow the majority of the time. Thus it is necessary the meters be most accurate between these two rates of flow. Testing a meter with unrestricted outlet permits a flow in excess of the meter capacity. If adjustment is made at this increased flow, it is possible the meter will be in error at its normal operating range.

For large flows and field testing it has been found convenient to use the flow of gas or air through a calibrated orifice as a standard. Such tests when made carefully are exceptionally accurate and conveniently run.

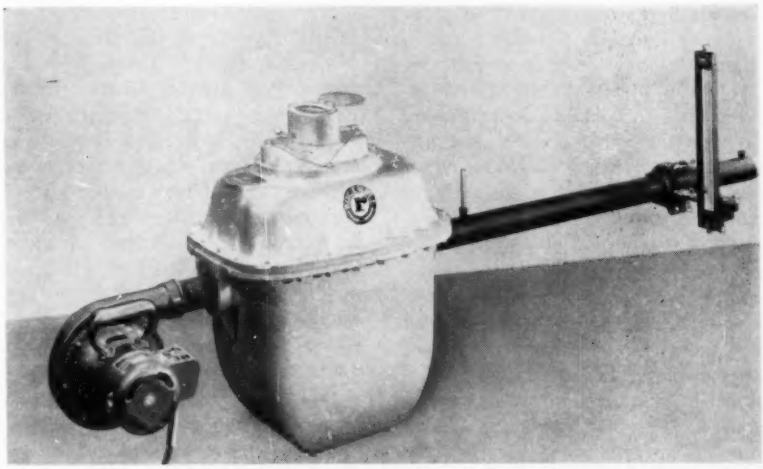


Fig. 3. Proving an industrial meter with a low pressure flow prover. Prover is connected to meter outlet.

The first provers of this type were called funnel provers. They consisted of a head, usually funnel-shaped, with various sizes of openings, plugged and unplugged with stoppers to give a predetermined rate of flow with a certain pressure on the upstream side of the orifice. This method developed into the more accurate flow prover.

The critical flow prover is based on the discharge through an orifice under pressures which are high enough to produce a critical velocity when the prover discharges to atmosphere. This type, of course, cannot be used on low pressures.

The low pressure flow prover, which is based on the flow through an orifice at low pressures, can be used more universally. *Fig. 3* shows the arrangement for testing a meter under low pressure conditions. In some cases it is desirable to test a meter under high pressure, and this can be accomplished by using a valve between the meter and prover so that the meter can be operated at high pressure and the prover at low pressure.

With a low pressure flow prover, large capacity meters can be tested under a wide range of flow up to the full capacity of the meter, and of great importance is the fact that a meter can be tested at the point of installation without being moved from its position. Where meters are installed with proper piping layout including proving connections, the meter need not be disconnected for test.

The flow tests can be conducted with either air or gas at either high or low pressure. The use of gas is frequently prohibited because of objectionable wastage and possible hazard. Therefore, tests must be made with air. Since the volumes required are comparatively large, it is preferable in many cases to employ a portable blower designed for low pressure testing.

Flow proving is generally accepted as the standard method of field testing large capacity meters because it provides a simple, complete and reliable test method which requires a minimum of time and equipment.

Vacuum proving is oftentimes desired for certain meter connections. It is particularly helpful in cases where it is desirous to leave off the handhole plate or meter cover during the proof runs to facilitate adjustment.

The low pressure flow prover is very easily converted to a vacuum testing device. Additional weights are added to the prover so the bell will raise with a vacuum of 1½ in. water instead of falling with a pressure of 1½ in. Rigged in this manner the prover quick connections must be connected to the exhaust connection of the meter and rate of flow is determined by an orifice or valve between the prover and meter. Runs should be made between the 4-ft and 2-ft prover markings and caution should be exercised that a vacuum is not pulled when the bell is completely down in the tank.

Test meters are sometimes used in proving. Here the accuracy of the proof depends entirely on the accuracy of the test meter. Since test meters are usually smaller than the meter being proved, tests are limited in capacity. In some cases a bank of test meters geared together or synchronized have been used to obtain sufficient capacity. Such an arrangement has the disadvantages, however, of being immobile and dependent upon several meter mechanisms which may or may not maintain their accuracy.

In general, the procedure recommended by the American Gas Association and the rules set up by most public service commissions specify that all domestic gas meters must be tested at one rate of flow equal to the rated capacity of the meter and at another rate of flow approximately equal to one-fifth the rated capacity. These two tests are commonly called the open and check rates of flow.

To bring the proofs at the two flow rates into the desired relation, the valves must be set in proper relation to the diaphragm stroke. If the valves cut off the exhaust of gas from the chambers too early, the meter will prove faster on the capacity flow than on the check flow. If the valves cut off late the capacity flow will be slower than the check flow.

To speed up the open flow, advance the valves by moving the tangent against the motion of the meter. To slow up the open flow, retard the valves by moving the tangent with the motion of the meter.

It is advisable to set the check flow slightly slower than the capacity flow on the final proof of a meter. Experience, as well as theoretical considerations, show that the open flow has a tendency to go slower than the check flow. This makes the check flow appear faster than the open flow, referred to as the spread between flows.

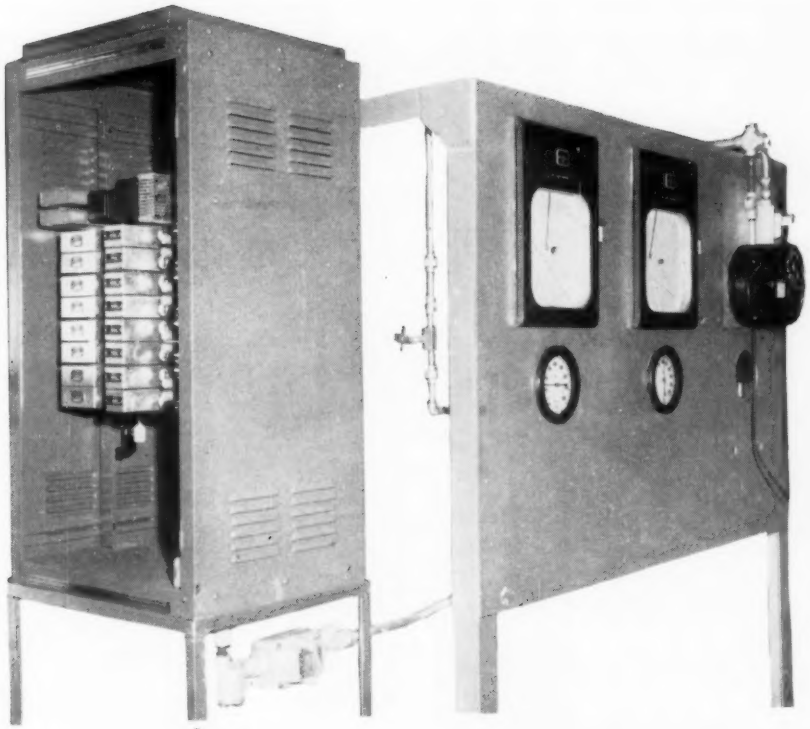
The differential or pressure loss through a meter is important as a means of finding trouble or improper performance of a meter. The differential gives an indication of the power required to drive the meter at any given rate of flow. When the differential is higher than the accepted standards for this rate of flow, some portion of the mechanism is not performing properly. A knowledge of the characteristics of the differential will insure prompt location of the cause. The differential test is really a check of the meter as an engine.

Possibly the most convenient method of measuring the differential is with a slope gauge. In this case, the pressure taps should be in the same plane with the meter. The conventional method of reading the slope gauge is to note the high and low points in the fluctuation and if the high point is above the accepted standard, something in the meter is not performing as it should.

Causes for extreme fluctuations in differential and high differentials are usually classified as follows:

1. Binding in moving parts at bearings or stuffing boxes caused by too close a fit or poor alignment of parts.
2. Dirt or oil on valves causing friction between valves and seats.
3. Improper valve setting.
4. Improper division of diaphragm stroke.
5. Lost motion.
6. Diaphragms not matched for stiffness and uniformity.

Too little attention to the differential has caused endless work in meter repair. A full understanding of the causes of high differential or great spread in the fluctuations will often make the solution of the repair problem simple. ■



GAS staff report

Audio continuous-tone equipment saves money for western utility

By DON WRIGHT, Managing Editor

Through the use of new equipment, two leased wire lines are now doing a job that formerly required several. And, in addition to saving Portland Gas money, telemetering is more efficient.

DISTRIBUTION companies who convert their systems from manufactured to natural gas generally find they have a need for more extensive telemetering operations as the daily volume rises.

The Portland (Ore.) Gas & Coke Co. is no exception. It became a natural gas distributor for the first time in late 1956, when Pacific Northwest Pipeline Corp. completed its *Scenic Inch* from the San Juan basin to the Northwest.

Portland's daily sendout skyrocketed upward. Several large industrial users were added to the system for the first time. This expansion brought about a necessary enlargement of the company's telemetering system.

When natural gas was first turned in, the company used separate wire lines (leased from Pacific Telephone & Telegraph Co.) to transmit data from several points in Vancouver and Camas, Wash., back to the system dispatch center in Portland. Data were needed from four points in Camas and eight in Vancouver. This made the leased wire line bill a substantial one each month.

Overall view above shows tone control equipment at the Vancouver, Wash., city transmitter, power unit, and telemetering gate station of Portland Gas system.

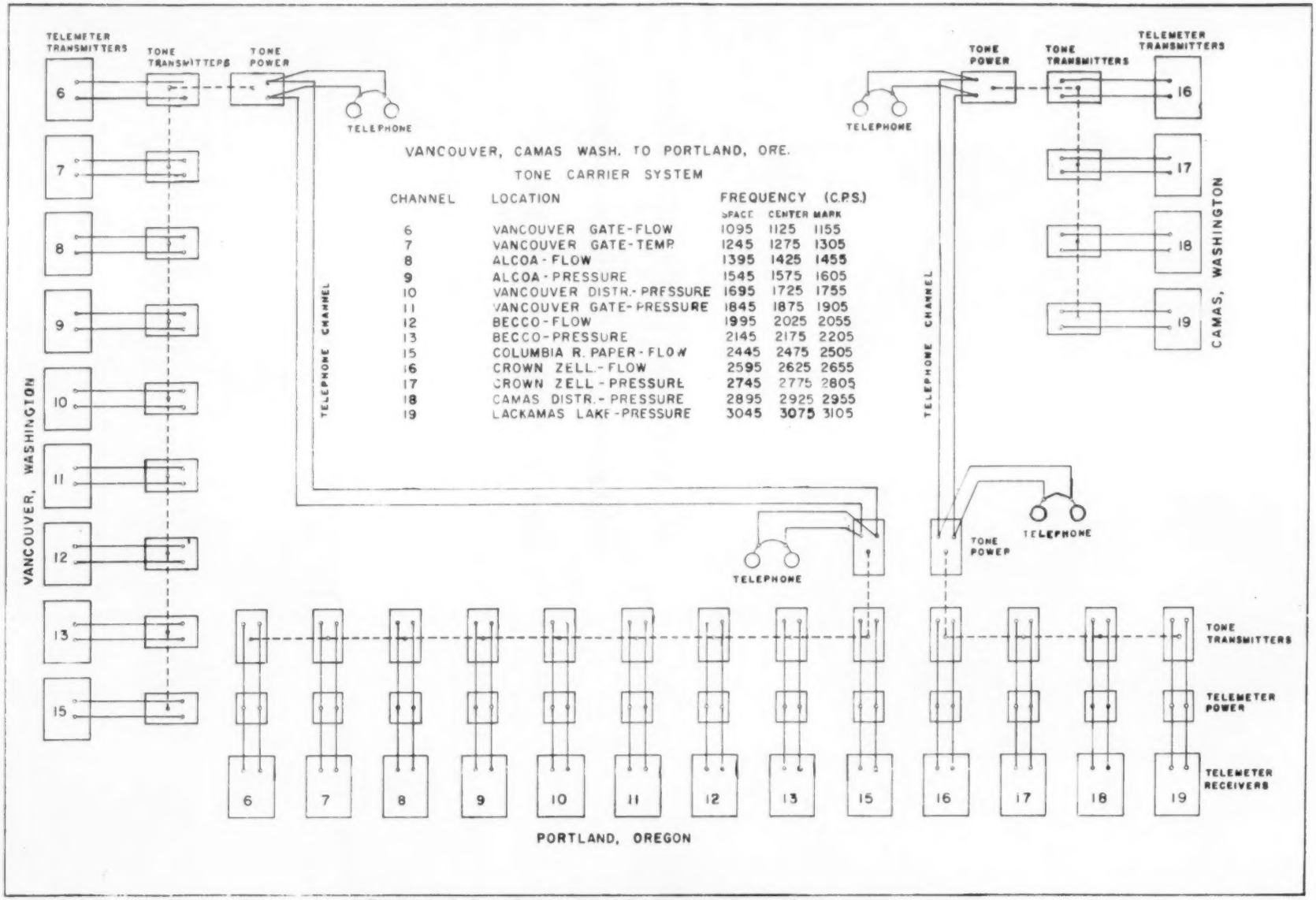
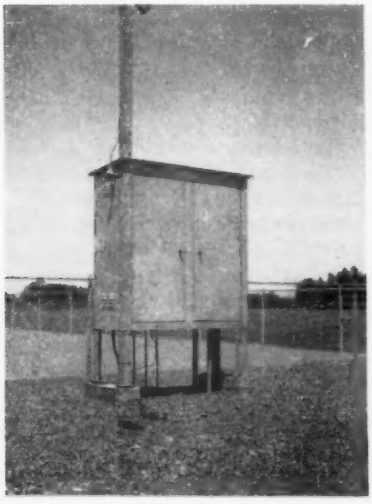

TELEMETER TRANSMITTERS
TONE TRANSMITTERS
TONE POWER
TELEPHONE
VANCOUVER, CAMAS WASH. TO PORTLAND, ORE.
TONE CARRIER SYSTEM
CHANNEL LOCATION FREQUENCY (C.P.S.) SPACE CENTER MARK
6 VANCOUVER GATE-FLOW 1095 1125 1155
7 VANCOUVER GATE-TEMP. 1245 1275 1305
8 ALCOA-FLOW 1395 1425 1455
9 ALCOA-PRESSURE 1545 1575 1605
10 VANCOUVER DISTR.-PRESSURE 1695 1725 1755
11 VANCOUVER GATE-PRESSURE 1845 1875 1905
12 BECCO-FLOW 1995 2025 2055
13 BECCO-PRESSURE 2145 2175 2205
15 COLUMBIA R. PAPER-FLOW 2445 2475 2505
16 CROWN ZELL.-FLOW 2595 2625 2655
17 CROWN ZELL.-PRESSURE 2745 2775 2805
18 CAMAS DISTR.-PRESSURE 2895 2925 2955
19 LACKAMAS LAKE-PRESSURE 3045 3075 3105
TELEPHONE CHANNEL
VANCOUVER, WASHINGTON
CAMAS, WASHINGTON
TONE TRANSMITTERS
TELEMETER POWER
TELEMETER RECEIVERS
PORTLAND, OREGON

Diagram of channel assignments for Portland Gas' audio tone equipment.

Readings at the Vancouver (Wash.) city gate station are converted to audio tones with this equipment (above), then transmitted to dispatch center in Portland, Ore., 10 miles distant. Lower left picture shows how equipment is housed. Lower right picture is a closeup of telemetering and tone control equipment.



Early this summer, the gas company installed audio continuous-tone equipment. This equipment (made by Motorola's Communications and Electronics Division, Chicago) is called a frequency-shift, voice frequency carrier by the manufacturer.

Portland Gas chose this equipment for two reasons: (1) it provides continuous readings for up to 18 separate sources of data per receiver, and (2) it affords a substantial savings in leased wire line charges from the telephone company each month. Portland is one of, if not the, first distribution company in the West to install audio tone equipment.

The Motorola voice frequency equipment is designed to provide a means of transmitting telegraph, teletype, telemeter, load control or other sub-audio and DC signals over an audio channel. It is specifically made for use in multiplexing or speech plus applications, and can be used over wire line, VHF radio, power line carrier, microwave, or other systems capable of carrying voice frequencies.

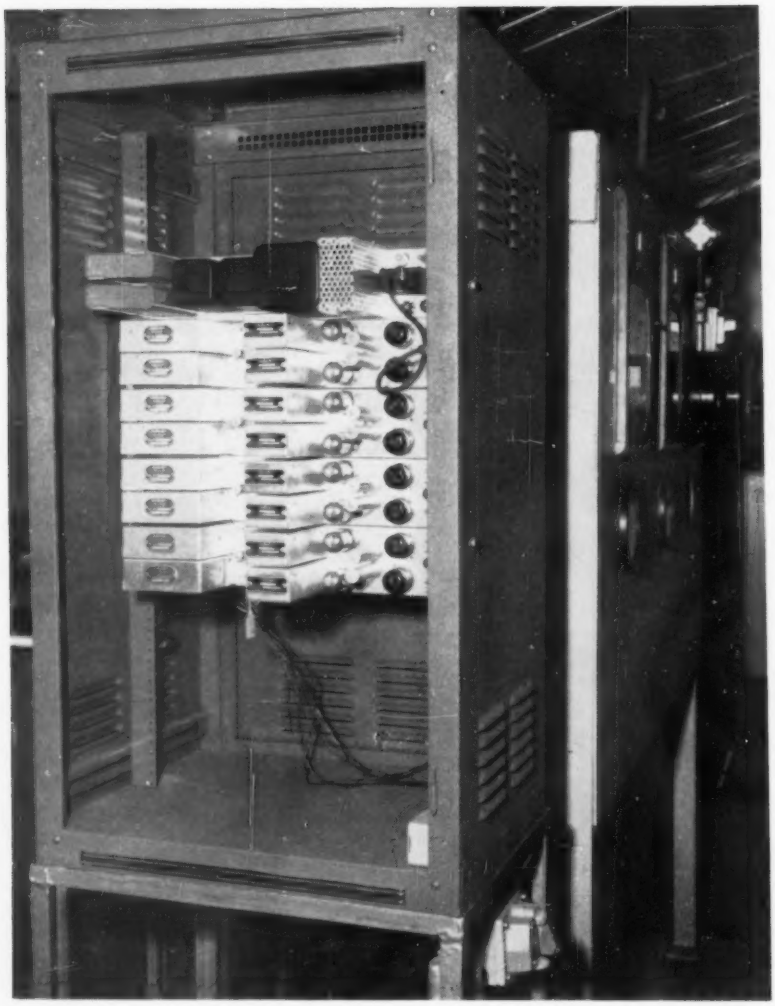
Eighteen voice frequency channels, spaced 150 cps apart in the 500- to 3100-cycle spectrum, are available on the equipment. The center frequencies of these channels range from 525 to 3075 cps.

Each basic transmitter and receiver chassis is dual channel, and may be equipped for single-channel or two-channel operation. The equipment can transmit three basic types of input signals: contact keying, current keying, or sine wave modulation.

The transmitter is a dual channel frequency modulated audio sending unit designed for use in telegraph, telemetering, teletype, signalling and dialing service. It consists basically of an oscillator, reactance modulator, limiter amplifier and output amplifier.

The receiver is also a dual channel frequency modulation unit, consisting of an input attenuator, an input filter, two-stage limiter discriminator, and a power amplifier for relay or sine wave output.

The Portland Gas voice frequency equipment operates with contact keying. A Bristol Metameter is used at each measuring point to open and close a dry circuit con-



Transmitting equipment is relatively simple, as can be seen in this picture made at the Vancouver city gate station.

tact. Closing of the key results in a voice frequency carrier shift of plus 30 cps ("mark" frequency), opening of the key results in a shift of minus 30 cps ("space" frequency) from the center frequency of the channel.

The reading taken by the Metameter is relayed to the Motorola transmitting equipment. Here, it is converted to an audio tone and superimposed onto the leased wire line (a standard voice grade two wire cable, operated by the telephone company). The audio tone is carried by wire line to Portland Gas' dispatching center, where it is received by the Motorola VF receiver. The tones are multiplexed, and relayed to the proper Bristol telemeter recorder.

All tones are received and recorded continuously, giving the Portland dispatcher a complete record of operations at each measuring point.

At present, 13 readings are being transmitted by VF carrier to the system dispatch office. Four of these come from Camas, Wash., 20 miles distant; the other nine from Vancouver, Wash., 10 miles away.

The Portland equipment, as it is presently installed, has a maximum of 14 possible channels (6 through 19). It can be expanded to the maximum of 18 channels by installation of additional receiving equipment.

Channel 6 through 15 (with channel 14 as a spare unit) are used to bring data from Vancouver. Readings are picked up from four separate points, and brought to Portland through a single two-wire cable. Thus, one leased wire line is performing a job that formerly required four separate lines.

The following information is telemetered via VF carrier from Vancouver:

Channel 6, Vancouver city gate flow; Channel 7, Vancouver city gate temperature; Channel 8, Alcoa plant flow; Channel 9, Alcoa meter pressure; Channel 10, Vancouver distribution system; Channel 11, Vancouver city gate pressure; Channel 12, Becco Chemical Corp. flow; Channel 13, Becco Chemical Corp. pressure; Channel 15, Columbia River Pulp and Paper Co. flow.

From Camas, Channels 16 through 19 transmit these data:

Channel 16, Crown-Zellerbach Corp. plant flow; Channel 17, Crown-Zellerbach Corp. plant pressure; Channel 18, Camas distribution system pressure; Channel 19, Lackamas Lake flow.

At present, Channel 14 is a standby spare unit.

The equipment is designed to transmit both voice and telemeter signals simultaneously. However, because of Pacific Telephone tariff restrictions, the Portland Gas system cannot be used for both purposes at the same time.

When a voice communication is made (by use of a telephone instrument that is part of the transmitting equipment), the audio tone telemeter signal is knocked out. When the telephone instrument has been replaced, the telemeter signal is automatically restored.

Portland uses the voice communication for normal workload purposes.

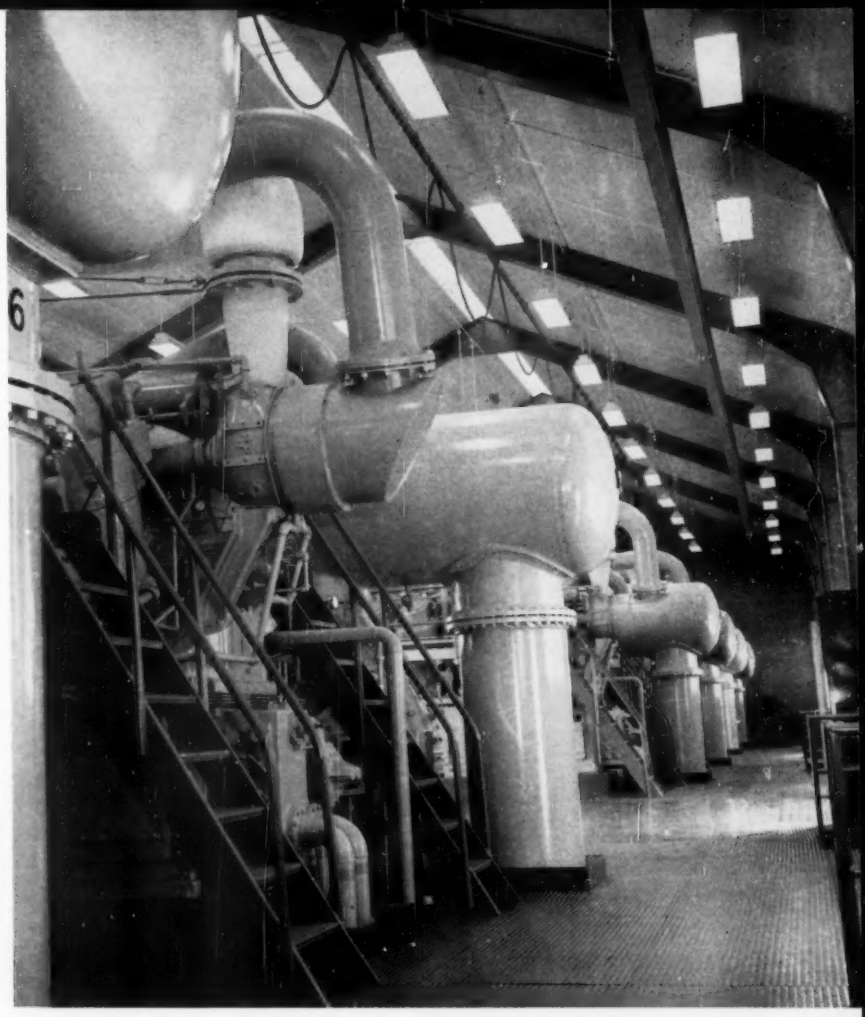
Company officials feel that the VF carrier system will save at least $2000 yearly in leased wire line charges, as well as provide continuous readings from the metered points.

In addition, Portland has found that the VF carrier system does not encounter the induction interference problems that are found on single wire lines.

The gas company's own personnel installed the VF carrier equipment and is now doing all the maintenance on it. ■

GAS exclusive

By JAMES JOSEPH



Compressor-end view of six of Ducommun station's eight engine-driven compressors.

Utility develops new plan for "intermittent maintenance"

"WITH natural gas low pressure storage, you design for peak loads, and expect to run your engines intermittently. . . ."

That, from a gas utilities engineer, sums up a problem endemic to the industry . . . and its low pressure holder compressor stations.

It means more tedious maintenance . . . and some significant rescheduling because most maintenance specs are based on round-the-clock operations, not intermittent run-time.

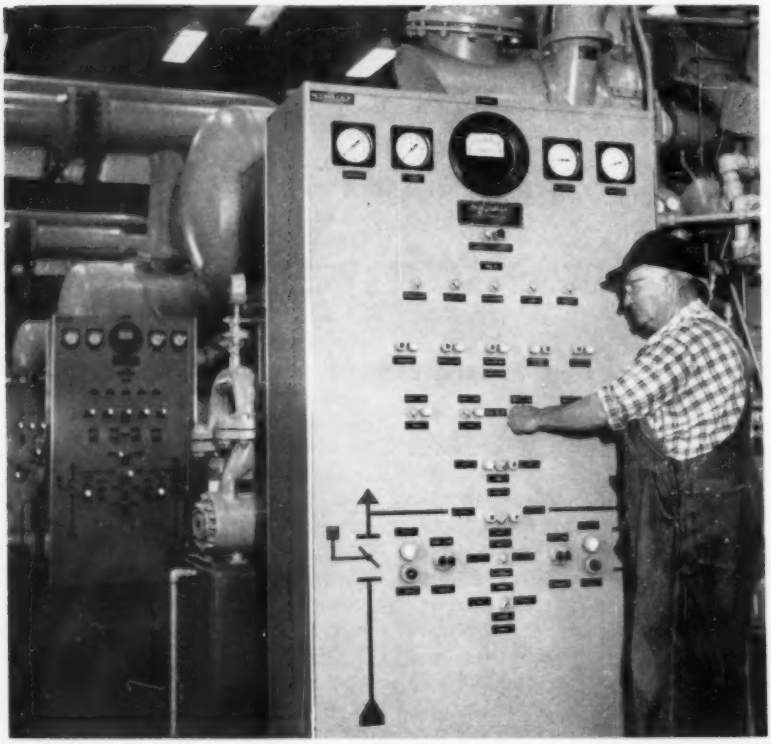
Typically, Southern California Gas Co. is taking a closer, harder look at routine maintenance as it puts into service eight, 2000-hp Ingersoll-Rand turbocharged gas engines and their compressors at its new $5 million Ducommun street station, in Los Angeles.

The eight Ingersoll-Rand type 412 KVS-2, direct-connected, turbocharged, 4-cycle, gas engine-driven, two-stage gas compressors are first of their type in California, and among the first operated by a western utility (some KVS-2s are operating along major gas distribution lines in Texas, Colorado, Montana and in the northwest).

At SoCal's Ducommun street station, S. T. Wrenn, the utility's east area plant foreman, sums up intermittent maintenance scheduling: "Running intermittently, you expect more maintenance . . . and some important digressions from suggested time-checks. It takes longer, operating engines on a peak-demand basis, to build up those hours . . . those important comparative hours."

On an average, for example, Mr. Wrenn expects each of Ducommun's KVS-2s to run six hours daily. But that may be at winter's peak (though a "peak load" may come at any season, depending on

Running intermittently, you expect more maintenance, and some important digressions from suggested time checks. Here, one of the compressors gets special check.



A complex unit control panel controls each engine. On an average, SoCal expects each unit to run six hours daily.

a number of distribution factors). Year around, only four engines may be working daily, and then only four to five hours apiece, with shutdowns probable during slack hours (just after mid-day and late at night, when gas usage traditionally ebbs). Monthly, then, Mr. Wrenn might expect at most 150 hours per engine. Yet Ingersoll-Rand terms "common for these engines" a run of 720 hours monthly, nearly five times Ducommun's anticipated run.

Ducommun's problem: to custom-tailor maintenance procedure to its own intermittent operation.

That's one reason, at least, why Mr. Wrenn has set up a maintenance program based on an anticipated run-schedule: rather than add crankcase oil once daily (as called for in suggested specs), Ducommun oil level is checked after every run (and an engine may run twice daily). Whereas, a constantly run engine's governor oil level should be checked once daily, SoCal, at least initially, is checking levels before each engine start-up . . . again, as many as two or three times a day. Where critical engine exhaust temperatures are usually checked hourly and recorded every eight hours, at Ducommun they're recorded every hour.

Says Mr. Wrenn, "What every intermittent station operator needs is a yardstick . . . records which, by data comparison, will signal trouble. That's one reason why we're cutting recording time, making more entries, doing more checking."

"By the book," lube oil pressure should be recorded every eight hours. At SoCal's Ducommun station, oil pressure figures are recorded every hour.

Cooling water temperature, another "critical," is, at Ducommun, scheduled for checking every hour (as the manufacturer suggests), and recorded every hour (instead of every eight, is suggested). And "soon," predicts Mr. Wrenn, "we'll have a record of every reading . . . under varying loads and ambient temperatures for our permanent records and future guidance."

More preventative maintenance and records? Lots more!

There's greater tendency for plugs to foul—what with condensation and more frequent air start-

ups. For, when starting air blows into cylinders, there's more chance of loosening rust and other products of normal oxidation. The result: greater tendency toward fouled plugs.

Frequent idling is another compounder of trouble . . . when, like Ducommun, you run intermittently. Turbocharged engines don't idle as smoothly as the natural air-aspirated. An occasional miss at "no load" rocks the engine . . . may loosen an engine's hardware. And Ducommun engines, if they hew to utility averages, may idle as much as 60 minutes a day. This includes a 15-minute warm-up idle prior to going on the line, another 10 minutes after the load has been taken off an engine, and before it's shut down. The procedure, for many an engine, may occur twice daily . . . perhaps more often, depending upon distribution needs.

Ducommun's assigned chore is to keep header pressure at 70 psi, the flow approximately 6 MMcf hr. Ducommun does this by supplying (from a number of gas holders perimetering the station), enough gas to make up for deficiencies in the line. From the station, gas feeds via seven lines (14- to 20-in. diameter) to a half dozen Los Angeles basin communities.

Neither Ducommun nor SoCal's dispatcher (who in reality controls Ducommun's operation), knows when or how much gas will be needed, until load requirements are known. That depends on a complex of factors, including actual system usage. Thus, routinely, Ducommun engineers warm up as many as four engines beginning at 6 a.m., in anticipation of needs. The engines, of course, are idling. By 7 a.m. the dispatcher normally knows the number of units needed and orders them on the line. The unused engines are shut down.

All this on-again, off-again running, with idling-hours building, illustrates some of the headaches in intermittent service . . . one reason why, unlike many more continuous stations, utility compressor plants like Ducommun have to play maintenance by ear . . . adapt and revise, until each station standardizes to what amounts to a custom-tailored maintenance procedure.

Mr. Wrenn has just put into operation a custom-tailored *hourly* check procedure.

"The most important checks," he explains, "in an operation of this sort. It's tedious . . . running all these checks hourly, but when you operate intermittently, there's not much choice."

"We do a lot of checking, especially with eight engines to look after," concedes Mr. Wrenn. "Of course, we try to balance engine hours. Still, we never know if one engine or eight will be needed. It all depends on distribution pressures . . . on orders from our central dispatching station."

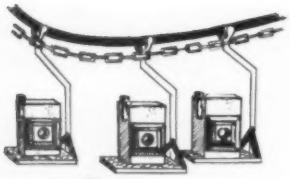
"But," adds Mr. Wrenn, "that's how you operate . . . when you run intermittently."

Load . . . and intermittent runtime . . . were the big reasons why SoCal, when it planned its $5 million modernization which replaced with gas compressors nine venerable steam compressors, decided on eight engines of fairly modest horsepower.

For, as one SoCal engineer puts it, "when we need pressure, we need it, and eight compressors are insurance against the failure of any one." ■

This is SoCal's hourly check list

(1) Ambient temperature (in °F)
(2) RPMS (from tachometer mounted on each engine)
(3) Air manifold (psi)
(4) Fuel manifold (psi)
(5) Air control valve opening (percentage)
(normal: about 45 per cent)
(6) Power cylinder exhaust temperature: (°F)
(on each of 12 cylinders)
Max. for cylinders (about 900°)
Min. for cylinders (about 800°)
Average ..... (about 830°)
(7) Turbine exhaust temperature (in degrees)
a. Fly wheel end....not over 900°F
b. Oil pump end...not over 900°F
(8) Jack water temperature (in degrees)
a. Power cylinder inlet (should be about 160°)
at...b. Power cylinder outlet (should be about 172°)
c. Fly wheel end, turbine outlet
(should be about 172°)
d. Oil pump end, turbine outlet
(should be about 172°)
e. Compressor cylinder outlet
(should be about °)
(unknown)
(9) Lube oil temperature (in degrees)
a. Engine inlet—135° to 140°
at...b. Engine outlet—150° to 160°
(10) Lube oil pressure (in psig)
a. Pump discharge (to bearings) in psig 50#
at...b. To fly wheel & oil pump ends
turbine in psig 32-35#
c. Drop across filter in psig 0-5#
(plus: lube oil added in gal.
(11) Compressor gas temperatures
Inlet—45-80° (depends on season)
intermediate—220-230°
Discharge—140-160°
(12) Suction pressure (inch water) 5½ to 10½ in.
(13) Discharge pressure (in psig) 60-85
(14) Time on (exact)...Time off (exact) hours run today
Total hours
(15) Berry pump discharge pressure (in psig) 550-600#



Conveyor system in meter shop helps company meet state laws

Paint stripping unit in Northern Illinois' meter shop permits cleaning in about 10 minutes. A hot caustic solution is first sprayed on meters, loosening paint. A hot rinse is followed by a gas-operated dryer, completing the operation.

UNDER Illinois Commerce Commission regulation, all gas meters in use in Illinois must be shop checked at least once every 10 years. This means that Northern Illinois Gas Co. at present must remove between 60,000 and 70,000 meters from customer premises and replace them with meters that have met rigid requirements.

Helping the company do this job is the La Grange, Ill., meter shop where a conveyor system carries meters through various operations with a minimum of lost motion. Planned to meet future needs, the shop will permit processing of more than 175,000 meters annually.

The first stop along the conveyor system is the in-proving test, then the meter takes a trip through the paint-stripping unit. After a 10-minute stretch of loosening the paint, rinsing it off, and drying, the meter emerges entirely free of paint.

A tag attached to the meter at the in-proving station indicates its next stop. If it needs repairs, the meter is side-tracked onto the repair conveyor. After it is adjusted or repaired, the meter rejoins the "okay" meters on the conveyor that travels to the hydro-pneumatic test station where the meters are checked for leaks.

When the meter has passed all tests, it is placed on a belt conveyor headed for the paint conveyor. The paint conveyor holds about 78 meters, all of which can be painted in about 13 minutes. The paint is a fast-drying type and the meters are sufficiently dry to handle by the time they reach the storage area ready for shipment. ■

Above: Making plans for the coming convention year are these newly elected AGA leaders (from left): treasurer, Vincent T. Miles, Long Island Lighting Co.; 2nd vice president, J. Theodore Wolfe, Baltimore Gas & Electric; and president, Robert W. Otto, Laclede Gas Co. Not present was A. W. Conover, 1st vice president.

Above left: The first AGA public relations achievement award is presented by outgoing president C. H. Zachry to Southern California Gas Co. for its "Facts About Natural Gas" program. Accepting the award is F. M. Banks (center), president and general manager of SoCal. Frank Sullivan, PR director of SoCal, holds a desk replica of the trophy.

Left: The four segments of the gas industry were represented by (l to r): C. H. Murphy, Murphy Corp.; Paul Kayser, El Paso Natural; Stanley H. Hobson, Geo. D. Roper Corp.; and Marvin Chandler, Northern Illinois Gas.

AGA convention parade—1957

Winners of the home service achievement award, sponsored by McCall's Magazine, receive plaques from Mrs. Elizabeth Sweeney Herbert (center), McCall's household equipment editor. Winners (from left): Kathryn L. Barnes, Equitable Gas Co.; T. W. Corr, receiving the award for Mrs. Jeanne P. Dabney, Southern Union Gas Co.; P. R. Shea, SoCal Gas, representing Mrs. Gretta Welch of SoCal; and Zelda Smith, Southwest Gas Corp.

New officers of the industrial and commercial gas section were elected at their annual business meeting in St. Louis. From left: new vice chairman, F. T. Brooks, Philadelphia Electric; L. E. Biemiller, Baltimore Gas & Electric, chairman of the nominating committee; chairman, Roy E. Wright, NEGEA Service Corp.; and J. Robert Delaney, Cincinnati Gas & Electric, outgoing chairman.

GAS news

Michigan PSC lifts heating restrictions

All restrictions on natural gas sales for homeheating in Michigan, except for territory served by Consumers Power Co., have been lifted by the Michigan Public Service Commission.

Michigan Consolidated Gas Co. (Detroit), Citizens Gas Co. (Adrian), Battle Creek Gas Co., Michigas Gas Utilities (Coldwater), and Michigan Gas & Electric Co. (Three Rivers) can now take unlimited orders.

Consumers objected to a commission order issued in August directing the companies to show cause why restrictions should not be lifted. Consumers says it cannot supply gas to about 144,000 of its customer applicants because of gas shortages. Commission observers commented it might be necessary to continue restrictions for Consumers for another year or two until sufficient supplies are found.

Liquid petroleum storage project planned by NIPSCO

Work on a $2.5 million storage project for L. P. gas will commence early next year by Northern Indiana Public Service Co., Hammond.

NIPSCO recently exercised its option on 40 acres of land a few miles northeast of La Porte, Ind., along the New York Central right-of-way.

Dean H. Mitchell, company president, said the year-and-a-half-long project will consist of a honeycombed net work of rooms mined at a depth of 350 ft at the bottom of a vertical shaft 42 in. in diameter. The rooms will be carved out of solid rock. Each will be about 30 ft high, 20 ft wide, and 30 ft long. They will be separated from each other by the walls of the rock structure. Tunnels will connect them.

For the past two months, NIPSCO engineers, aided by consultants, have been conducting exploratory core tests on the rock formations in the area. Satisfactory rock strata was found 300 ft below the surface of the earth. Solid rock begins about 185 ft below the earth's surface and continues for a depth of 596 ft, which is as far as drilling tests have gone.

The 42-in. shaft will be used during construction for the passage of men and equipment to the floor of the cavern, where the equipment will be assembled and used to excavate the storage rooms.

The cavern will have an estimated capacity of about 300,000 bbl of liquid petroleum, which will be transported to the site by rail or truck and pumped into the storage rooms. It will be withdrawn when needed and transported to the company's gas mixing plants in East Chicago, South Bend, Fort Wayne, and Peru, where it will be vaporized and blended with natural gas for distribution to customers.

The surface area above the cavern will be used for pumping facilities and railroad connections. When the project is completed, the shaft will be sealed around service pipes through which liquid petroleum will be pumped in and out of the storage facilities.

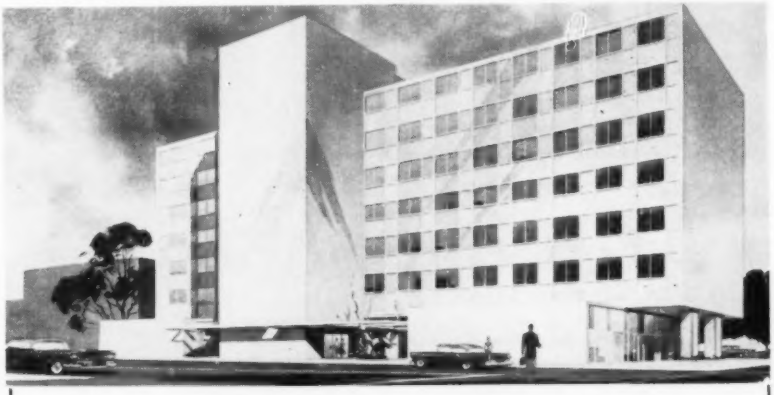
Gas Service Co. buys Central's Missouri plant

Central West Utility Co. was granted Missouri Public Service Commission permission to sell out its Clay county operations to Gas Service Co. of Kansas City.

Last May the purchase price for distribution lines, franchises and a gas plant was set at $900,000. Gas Service would take over Central's operations and continue the present rate levels, submitting new rate schedules later.

SoCounties gives telemeter equipment to university

Three pieces of telemetering equipment have been presented to the University of Southern Cali-



Air conditioning in Albuquerque

THE newest and most modern air-conditioned office building in Farmington, N. M., will be cooled and heated by gas-fired equipment. Gas will be supplied by Southern Union Gas Co. from fields in the San Juan basin.

Owned by New Mexico Western Industries Inc., the $1.5 million building will house retail stores, a restaurant, and office space for major oil companies and individuals.

From the time tenants and customers enter the lobby until they leave the building, they will enjoy the comforts of natural gas air conditioning. The building, which will contain approximately 40,000 sq ft of floor space, will be cooled by a single 151-ton Carrier absorption-type unit located in the basement. Here also will be the gas-fired boiler, which furnishes steam to operate the unit.

A 15-hp water pump capable of circulating about 453 gal. of water per minute, will distribute chilled water through a high pressure double-duct system, permitting individual temperature control to every room in the building. The cooling tower, to be located on the roof, will cool 525 gal. of water per minute from 97.5° down to 80° with the use of another 15-hp pump.

Telemetering equipment, a gift from Southern Counties Gas Co. to the University of Southern California school of engineering, is accepted by Dean Robert E. Vivian (center), and Assistant Dean George T. Harness (right), of U.S.C. SoCounties Vice President Jay Davis, Jr. made the presentation.

fornia School of Engineering by Southern Counties Gas Co., Los Angeles.

The instruments — a recorder, transmitter and controller—were used at SoCounties' Santa Monica Bay division. As gas supplies were increased in the division and system pressure was raised from 4-5 psi to 15-20 psi, the telemetering equipment became unnecessary.

At USC the instruments will find ready use for training students in petroleum, electrical and chemical engineering, according to Dean Robert E. Vivian and Associate Dean George T. Harness.

Florence Stove buys Geo. D. Roper Corp.

The Geo. D. Roper Corp. of Delaware, the sales subsidiary of Roper, and Roper's gas range and clothes dryer business has been bought by Florence Stove Co. Manufacture of Roper products will continue at the company's Rockford, Ill., plant for the time being.

L. R. Jensen, formerly vice president in charge of Roper's appliance division, has joined Florence in charge of all manufacturing operations. Carl Sorby, N. C. Kreuter and W. J. Foster will be vice presidents of the Delaware company in sales capacities similar to their present responsibilities with Roper. The present Roper field sales organization and the Rockford general sales office personnel will continue marketing the Roper products. The general sales offices will

HYDROHOE Moves Dirt While Traffic Moves

Here's a hoe with hydraulic wrist action that trenches for gas mains or house connections, uncovers leaks, digs valve pits, sets pipe, handles most dirt-moving and lifting chores on busy city streets — *without* blocking traffic.

The all-hydraulic Hydrohoe supplies more digging and lifting capacity with less weight and in less space than ordinary machines. The Hydrohoe's extremely short tail swing and standard commercial truck mounting let it work along curbs and gutters in little more space than a parked car.

The Hydrohoe's light truck mounting lets you travel through traffic at regular truck speeds . . . up to 50 mph on the open highway. Hydraulic outriggers that extend and set in seconds provide bedrock stability . . . take all working stresses off the truck.

A choice of dipper sizes and types gives you unsurpassed versatility. For example, the 20-in. utilities dipper rotates from 45 degrees behind the handle to 50 degrees ahead . . . lets you dig short, deep holes with a minimum of waste time and effort.

Put this fast, compact, all-hydraulic Hydrohoe on your jobs soon. Your nearby Bucyrus-Erie distributor will supply details.

196H57

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SOUTH MILWAUKEE, WISCONSIN

REYNOLDS

NRT-8010 SERIES

New House Service Regulator

NEW ALUMINUM BODY AND TOP
CAST IRON INLET UNIT
V-TYPE STAINLESS STEEL BAND

ONLY ONE STAINLESS SCREW with nut to remove for complete orifice and valve pocket. Permits exchange of diaphragm case without removing inlet unit from line.

Supplied as:

1. No seal type
2. No seal type with automatic cutoff
3. Internal diaphragm operated relief valve for complete over pressure protection
4. Internal diaphagm relief and automatic cutoff

REYNOLDS
REGULATOR CO.
ANDERSON, INDIANA

1897 1957

PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN
STOPPER CO. INC.

GOODMAN
USED SINCE 1897
2" HANDLE & LOCKING SLEEVE
GAS MAIN STOPPER

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Brooklyn 17, N. Y.
Cable Address GASTOPPER, N. Y.

be transferred to Kankakee, Ill.

S. H. Hobson, president, and J. H. Makemson, executive vice president of Roper, will be elected to the Florence board and will remain as directors of Geo. D. Roper Corp. of Delaware.

Florence will continue the manufacture of Kenmore and Florence gas ranges. John P. Wright, president of Florence, said that no change is contemplated in the Roper products or merchandising policies.

Northern Illinois connects 600,000th customer

Ceremonies conducted by Northern Illinois Gas Co. recently marked an increase of 100,000 new gas customers in the last 27 months and the installation of its 600,000th customer meter.

Installation of a gilded meter for customer No. 600,000 came just over two years since the 500,000th customer received gas service in July, 1955. Marvin Chandler, president of the company, presented a new gas clothes dryer to the lucky family in its new all-gas home in a Chicago suburb.

Commenting on the occasion, Mr. Chandler said the annual per cent increase in gas customers in northern Illinois has been greater than that of the nation each year since 1949, and was about twice as rapid last year. The number of customers has practically doubled. In addition to the increase in number of customers, the average annual therm use per residential customer has more than tripled since 1940, President Chandler said. From 299 in 1940, it has soared to about 982 this year.

First line pipe mill for Southeast slated

Construction on the Southeast's first line pipe mill for the manufacture of welded steel, stainless steel and aluminum pipe and tubing is slated to begin early in March, 1958. In making the announcement, Aluminum Tubing Co.'s general manager, Howard H. McCarl, said the Jacksonville, Fla., installation will produce pipe ranging from 4½ in. to 14 in.

Steel pipe will be welded by the electrical resistance welding process using equipment manufactured by the McKay Machine Co. Stainless steel and aluminum pipe will be welded by the inert-gas-shielded

SAVE THREE WAYS WITH THERMAC SLS

COMBINATION

Controls

AUTOMATIC RECYCLING MANUAL OPENER (optional)

SERIES "SLS" SAFETY REGULATOR WITH 100% SHUTOFF IN CONJUNCTION WITH QUIET AUTOMATIC MAIN GAS VALVE

SLS 101—½"
SLS 201—¾"

This control with Independent Safety Shutoff Valve (not a Safety Solenoid Switch in series) assures safe use (even when equipped with the automatic recycling manual openers) on all gravity, conversion, and forced air heating equipment.

Since the CONTROL, a complete package, is an all-in-one-unit, the installation and piping is easy—no individual devices to crowd together into limited space. Inventory problems are also simplified.

Field service is a cinch! Simply remove four screws to dismantle either the safety or solenoid head. Why not check the THERMAC MODEL SLS on your furnaces immediately. You'll enjoy top performance and save three ways: installation time, installation space, and overall control cost. Send for prices and delivery.

THERMAC

HM COMPANY

Certified by A.G.A.

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tungsten-arc and high frequency resistance process.

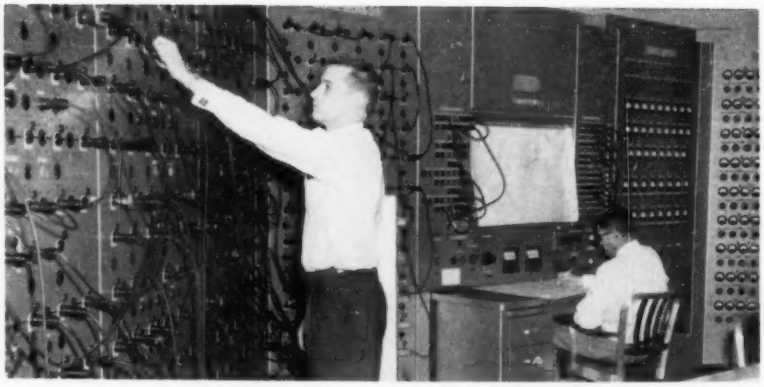
Steel pipe will be produced for oil and gas gathering, transmission, and distribution lines, water and oil well casing, municipal and project water systems and construction piping.

Albuquerque terminal ready for Southern Union

Slated for completion last month was Southern Union Gas Co.'s new $150,000 terminal and warehouse in northeast Albuquerque, N. M.

The prefabricated all-steel structure houses offices for the company's construction, engineering and maintenance crews, and a radio base station for its radio-equipped trucks.

E. C. Reddy, district manager of Southern Union, said the building has 27,000 sq ft of floor space. In addition to the warehouse, offices, and shops, it has training rooms for employees, facilities for meetings, and gas appliance testing rooms.



Technicians of Columbia prepare the pipeline network analyzer for action in its new quarters at the recently opened building in the Columbus, Ohio, suburb of Marble Cliff.

Columbia's new service building opened

Columbia Gas System Service Corp.'s new $1.5 million building in Marble Cliff, Ohio, has been completed.

The two-story building will be a vital spot in Columbia Gas System operations over a seven-state area including Ohio, Pennsylvania, West Virginia, Virginia, Kentucky, Maryland and New York. The service organization, a Columbia Gas System subsidiary, does engineering, research and other services for Ohio Fuel Gas Co. and other operating companies in the system.

Key system offices are in the new building and many of the functions important to system-wide operations will be carried on there. It also houses the system's pipeline network analyzer. A centralized billing department, where billing of the 1.3 million retail customers of Columbia will eventually be handled, is also housed in the building.

E. R. P. engineers use modern methods to get design data for a pipeline cathodic protection system. This group is making current requirement tests for designing a ground bed.

E.R.P. DESIGNS CATHODIC SYSTEMS
That Give Maximum Pipeline Protection

E. R. P. corrosion engineers are trained specifically in cathodic protection techniques. They evaluate all pertinent data *before* designing a pipeline cathodic system. *After* design and installation, continued E. R. P. surveys help maintain the efficiency of the system. They warn of environmental changes that affect complete protection.

Cathodic protection is, after all, like any tool. It requires skill and knowledge to use the tool successfully.

The cost of a cathodic system should always be measured by the savings achieved through maintaining full corrosion control, not just by the first cost of the system. On this basis E. R. P. designed cathodic systems give maximum savings for each dollar spent. For full information about E. R. P. cathodic protection for pipelines write for Bulletin E-43.

ERP CATHODIC PROTECTION SINCE 1935

ELECTRO RUST-PROOFING CORP.
A SUBSIDIARY OF WALLACE & TIERNAN INC.
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CABLE: ELECTRO, NEWARK, N. J.

SoCounties plans new downtown L.A. building

Southern Counties Gas Co. plans to build a 13-story headquarters office building in downtown Los Angeles.

The $2.25 million structure will go up on a corner lot adjoining existing buildings of Southern California Gas Co. SoCal will use the ground floor as display and customer contact area.

Also housed in the new building will be Pacific Lighting Gas Supply Co., another SoCounties affiliate; and local executive offices of Pacific Lighting Corp., parent organization of the three utilities. In addition, more than 30,000 sq ft of space will be rented, according to SoCounties president and general manager, Guy Wadsworth Jr. Occupancy is slated for July 1959.

July 1959 is completion date for SoCounties new headquarters in downtown Los Angeles.

Arkla expects doubling of air conditioner output

Arkla Air Conditioning Corp. expects to more than double production of air conditioners at the Evansville, Ind., plant next year. Arkla also anticipates the sale of 4600 units under a special package deal with 50 gas companies across the country.

Following a meeting with J. C. Hamilton, president of Arkla Air Conditioning and Arkansas Louisiana Gas Co., the AGA's air conditioning promotion committee has constituted itself a task force. A key agreement reached at the meet-

Look what Trenchmobile® can do *for you*

On house-to-street service connections, Parsons 88 Trenchmobile makes vertical set-ins, flush with foundations. Hinged crumber swings up, out of the way — positive down-crowd boom starts cut fast, holds accurate grade. It also undercuts walks, curbs, cross-pipes, saves costly hand clean-up. Shiftable, reversible spoil conveyor dodges trees, hedges, poles, and other side obstructions. On many operations, Parsons Trenchmobile backfills its own trench — 6-foot blade optional.

Digs 8 to 16 inches wide

When your work schedules call for main-line extensions, pipe reclamation, or trouble-shooting, this utility-size trencher has plenty of capacity to fill the bill. You get trench widths from 8 to 16 inches, depths to 5 feet. Digging speeds range from 0 to 14.5 feet per minute.

Self-sharpening "Tap-In" teeth assure maximum digging efficiency at every depth, width, in all materials. Hinged crumber sweeps trench bottom clean, ready for pipe. Consider, too, what Trenchmobile's rubber-tired mobility can mean on your scattered trenching jobs.

Drives anywhere

A job 6 miles away can be started in less than 30 minutes from "now". Trenchmobile drives around town at 12.6 m.p.h. There's no waiting for trailer — and no loading or unloading delays.

Better see your Parsons distributor soon, or send for Trenchmobile catalog. (Also check Parsons big, crawler-mounted Trenchliners®.)

Want more facts?

mail to: PARSONS Company, NEWTON, IOWA (Division of Koehring)

Send us latest catalog on rubber-tired 88 Trenchmobile.

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COMPANY..... DIV.....

STREET.....

CITY..... STATE..... PG76 GAS

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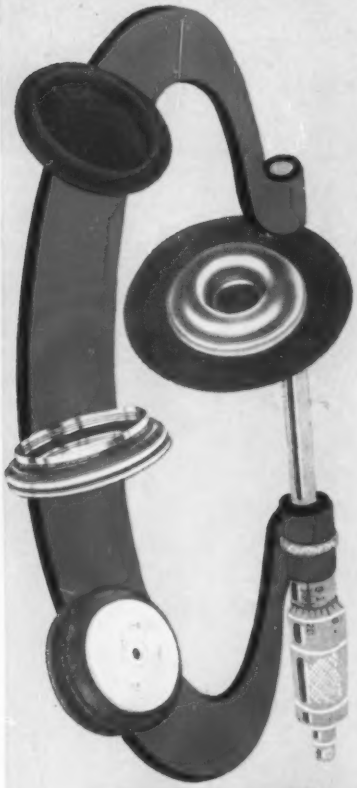

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...and a stock item

.0035 of an inch in thickness! . . . AND UP. . . with sensitivity, strength, long life for continuous accurate regulation and registration. Vulcan diaphragms—quality controlled from raw material to finished product—are the accepted standard proved by use from city gate to home and factory. They're adaptable — equally efficient with L. P., natural, manufactured gas or combinations.

Another

REEVES VULCAN
RUBBER PRODUCT

Diaphragms for regulators, meters, instruments and controls.

Coverlight, neoprene coated nylon for protective coverings.

REEVES BROTHERS INC.
Vulcan Rubber Products Div.
54 Worth Street, N.Y. 13, N.Y.

ing offered the prospect of a 20 per cent reduction in prices of residential air conditioning units provided utilities accept responsibility for a minimum quota of air conditioner sales.

To achieve this goal, each member of the AGA committee has been assigned a personal quota, for which he is to obtain assurances from gas utilities in his area. In addition, a series of regional symposiums will be held across the country early in 1958. The symposiums will cover both residential and commercial-industrial air conditioning, and will include special sessions on sales and operation.

Other action by the committee included measures to promote acceptance and use of gas air conditioning equipment. One such step was endorsement of an AGA proposal to appoint a sales promotion representative in Washington, D. C., to represent the gas industry with government. Plans for national advertising and promotion of air conditioning by AGA were reviewed. Case histories of successful gas company air conditioning advertising and promotion campaigns were to be placed at the disposal of Arkla and any other interested gas air conditioning manufacturers.

A vote of confidence was given to the officers of the Arkla organization.

Mr. Hamilton outlined the policies which Arkla will follow:

Arkla was to take over immediately operation of the former Servel plant at Evansville, Ind. Sales headquarters at Little Rock, Ark., will market the air conditioning units under the trademark "Arkla-Servel."

A vigorous research program will be coordinated with the AGA research program and that of the Southwest Research Institute.

Arkla plans to raise the heating capacity of the five-ton direct-fired unit from its present 96,000 Btu to 144,000 Btu for use in the northern U. S.

A considerable expansion of the former Servel air conditioning sales staff is planned. These people will work closely with gas utilities.

Arkla will do its own national advertising and promotion.

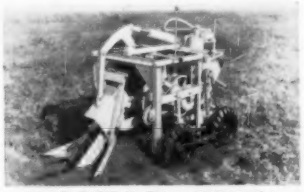
Arkla is considering the possibility of developing an add-on gas air conditioner in addition to the units now available.

A service organization, including

FOR FAST, LOW COST DIGGING USE A Pow-R-Ditcher

Model 4T Pow-R-Ditcher

There's no worry about those "tight spots" with a rugged 4T Pow-R-Ditcher. Extremely maneuverable and only 48" wide, the 4T really does a fast digging job . . . and at the lowest possible cost, too. Digs 6" to 14" wide and can be transported in a pickup truck. Here's a one man self-propelled unit that is ideal for the light construction field . . . and the low, low price is attractive, too!



Model W-2 Pow-R-Ditcher

The smallest of the Pow-R-Ditcher line . . . the W-2 is built to take it, with heavier chain, heavier hydraulic boom and heavier frame. Only 10' long, 51" high and 48" wide, an excellent unit for digging 2½" to 4" wide gas service, electrical service or shallow water lines. Has self-propelled 4-wheel drive. A real workhorse!

Write for Literature and Low Prices on the Complete Vermeer Pow-R-Ditcher Line

Larger Pow-R-Ditcher model also available. See the Pow-R-Ditcher in action . . . and CHECK THE QUALITY AND PRICE before you buy. Write or visit your Vermeer dealer.

VERMEER MANUFACTURING CO.
1441 W. WASHINGTON • PELLA, IOWA

a school for gas company employees, will be set up by Arkla.

In a report on progress of the AGA air conditioning research program, Allen Schrodt, director of the PAR program, said that AGA would reach its goal for this year by having at least three operating experimental units of new air conditioning systems ready for demonstration to interested manufacturers by the end of 1957.

At least nine manufacturers were reported actively interested in one or more of the new gas air conditioners under development.

Officers and directors of Arkla are L. L. Baxter, president of Arkansas Western Power Co.; W. W. Selzer, director of business promotion for Columbia Gas System Service Corp.; S. R. Walker, president of Fort Smith Gas Corp.; C. H. Zachry, president of Southern Union Gas Co.; W. R. Stephens, chairman of Arkansas Louisiana Gas Co.; J. C. Hamilton, director and president of Arkla; D. W. Weir, vice president and manager of operations; E. N. Henderson, vice president in charge of research and development; and D. P. Raney, investment executive. Other officers of Arkla are James Chisum, treasurer, and F. L. Holleman, secretary.

New incinerator standards effective in January

On Jan. 1, 1958, a revised approval standard for domestic gas incinerators will become effective. Recently approved by the AGA approval requirements committee, the standard stresses smokeless-odorless performance.

Incorporated in the standard are provisions outlining new test procedures used to evaluate (1) incinerating effectiveness, and (2) smoke, odor and fly ash elimination characteristics. These new test procedures and other revised construction and performance specifications have been incorporated in the standard to upgrade this type of equipment.

Gas, electric companies reach supply settlement

Southern California gas and electric utilities have announced a long-term plan providing for delivery of more gas for use in the area's steam electric generating plants.

The proposal by Southern California and Southern Counties Gas companies and Southern California

Cut Steel or Cast Iron Pipe up to 12" EASIER and FASTER

WITH THE NEW REED

HINGED 4-WHEEL PIPE CUTTER

- Closed Frame Construction assures complete rigidity with less weight.
- 4-Wheel design needs minimum swing of handle.
- 4-Point pipe guide aligns cutter for perfect tracking of wheels and a right angle cut.
- Quickly interchangeable wheels for steel or cast iron.
- Needs only 3" space to pass under 12" pipe.

• For ditch work or similar close-quarter operations these new Reed Cutters are practically indispensable and fully justify replacing whatever cutting equipment you are now using.

You can, for example, cut 8" steel pipe in less than five minutes, and cast iron pipe even faster.

Available in five sizes for steel or cast iron pipe from 1" to 12".

FOR FAST TURNING IN TIGHT SPOTS—
USE THE IMPROVED REED CHAIN WRENCH

Handles range from 10" to 60" in length.

You can tighten up or "back off" without taking wrench from pipe.

These improved chain wrenches will do anything an ordinary pipe wrench will do . . . and do it easier, better and faster. Ideal for ditches or tight corners.

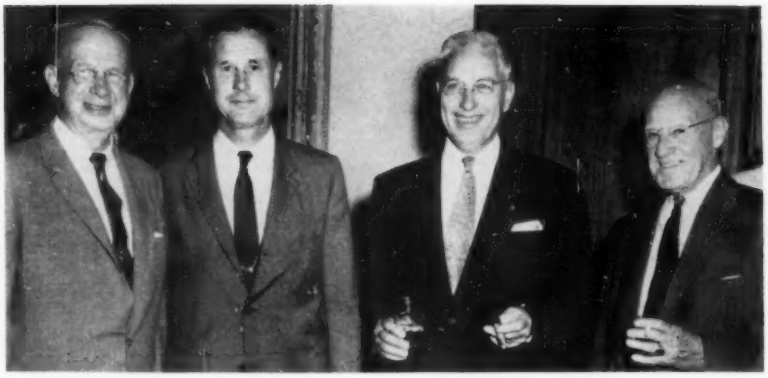
Grip securely with no play, yet they have a ratchet-like action.

REED

Unconditionally guaranteed to be the most efficient tools you have ever used. See your jobber or write for literature.

REED MANUFACTURING COMPANY
ERIE • PENNSYLVANIA

Edison Co. will be submitted for California Public Utilities Commission approval. It follows months of negotiations among representatives of the three companies, as requested by Commissioner Matthew J. Dooley. It will include an arrangement under which the gas companies will make available to Edison on an exchange basis gas which the Edison company contracted for from Richfield Oil Corp. The gas companies had protested Edison's plans to construct a 130-mile pipeline for delivery of the Richfield gas to its generating stations in southern California. If the proposal is approved, Edison will drop its pipeline plan.



American Meter Co. and gas industry officials gathered recently in New York to honor James J. Cooney on his 50th anniversary with the company. Mr. Cooney, district sales manager, is shown (left) with American President William G. Hamilton; James Webb, superintendent of Consolidated Edison Co.'s meter bureau; and Charles Harris of Long Island Lighting Co.

The gas companies will submit to the PUC a proposed new tariff schedule and priority system for all steam electric generating agencies in the southern California area. Under the schedule, a portion of the service will be provided on a "semi-firm" basis, subject to curtailment only to meet the needs of the gas companies' firm customers. The new arrangements will probably enable the gas companies to further increase the substantial quantities of gas recently contracted for from out of state.

GAS news notes

Recommended practices for installing domestic gas-fired incinerators have been reprinted by the incinerator division of GAMA. Detailed instructions, with diagrams, cover installation of incinerators, piping, flues, and vents. The 12-page booklet is available from GAMA, 60 E. 42nd St. New York 17, for 15 cents a copy.

Pennsylvania's department of forests and waters has awarded drilling rights for the first offshore gas and oil exploration in Lake Erie to New York State Natural Gas Corp., Pittsburgh. The

FLAME RETENTION

COMBUSTION EQUIPMENT

ENGINEERED By THE WEBSTER ENGINEERING COMPANY

COMBUSTION with SAFETY

Unparalled safety is but one of the features of WEBSTER'S revolutionary non-premixing ring gas burner incorporating flame retention regardless of air velocity.

Factory assembled Forced Draft Series H packaged units are available for Gas, Rotary Oil or Combination. Other variations soon to be available.

Some Territories Open

Write for Series B13 literature.

The WEBSTER ENGINEERING Company

TULSA 16, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

Dealer, manufacturer, and gas utility joined hands in Columbus, Ohio, recently to kick off a new gas range sales promotion for a chain of 46 stores. Leroy Klein (left), vice president of Caloric Appliance Corp., demonstrates the new "burner with a brain" gas range made especially for sale in the stores. Looking on is Paul D. Miller, dealer sales manager for Ohio Fuel Gas Co. (center), and Carl R. Wunderlich, merchandise manager of appliances for the store chain.

company submitted high bids for the rights on two tracts of the lake, one near the Ohio border and the other near the New York border.

Rockwell Manufacturing Co., Pittsburgh, has acquired ILO-WERKE, a leading West German manufacturer of two-cycle, air-cooled diesel and gasoline engines. This is Rockwell's first wholly owned manufacturing subsidiary in Europe. The purchase represents an initial investment in excess of $2 million in cash.

Dresser Industries Inc. has acquired Gardner Co., Quincy, Ill., producer of compressors, pumps, rock drills and air tools. The transaction is subject to approval by shareholders of both companies. Gardner-Denver will be combined with four present subsidiaries of Dresser to form a new, wholly owned subsidiary of Dresser Industries Inc. It will be known as Gardner-Dresser Co.

A. M. Byers Co., Pittsburgh, has entered into the plastic pipe field with its line of Byers PVC pipe. The plastic pipe is made for Byers by General Tire & Rubber Co. The company's present technical staff is handling the PVC pipe, available in sizes ¼-in. through 6-in.

INVESTIGATE THIS TIMELY MESSAGE!

NEW HELP FOR CORROSION PROBLEMS . . .

TEST THIS IMPORTANT DEVELOPMENT . . .

. . . FOR GAS LEAKS

perf-a-seal TRADE MARK 126 A

A Reinforced EPOXY Compound tested and currently used by leading Gas Distribution Companies

The strongest sealing agent yet for patching gas pipe leaks, PERF-A-SEAL Epoxy is a truly important new development in the fight against corrosion. In actual test and use, this Epoxy Compound assures you . . .

- **Highest Tensile**
- **Maximum Corrosion Resistance**
- **Highest Impact**
- **Highest Burst Strength**

Supplier to America's Leading Gas Distribution Companies

Would you like more details? Just write or phone for our trained representative.

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FATCHEMCO T. E. B.

A Universal Tar Emulsion Breaker

Eliminate tar emulsion "headaches"
Produce dry tar efficiently
Save Money on Time, Steam Costs and Labor
Proved in use by over 100 Gas Companies

Write for information and sample.

UNIVERSAL CHEMICALS CORPORATION
Lonsdale, R. I.

GAS people

A. M. Beebee

R. A. Ginna

E. J. Howe

L. H. East

ROBERT E. GINNA became chairman of the board and chief executive officer of the Rochester (N. Y.) Gas & Electric Corp. last month. He succeeds ALEXANDER M. BEEBEE, who retired from that post. Mr. Beebee becomes chairman of the executive committee and will continue as a member of the board. At the same time, HAROLD S. WEATHERBY became secretary of the company, succeeding PAUL J. W. MILLER. Other changes include RAYMOND N. BALL, formerly chairman of the executive committee, continues as a director and member of the executive committee; ERNEST J. HOWE, formerly vice president and comptroller, is now president and continues as a director and member of the executive committee; LEO H. EAST, formerly vice president in charge of operations, now executive vice president; PAUL W. BRIGGS, formerly superintendent of general accounting, now assistant secretary; and ROBERT W. BALL, formerly assistant to the treasurer, is now assistant treasurer.

CHESTER CRUMBAKER has been named district manager at Danville, Ky., for Western Kentucky Gas Co. He succeeds MERLE MEYERS, who resigned recently.

JOHN R. HARVIN, vice president and counsel for Columbia Gas System Service Corp., has been elected vice president and director of Columbia Gas System Inc., parent company.

ARTHUR F. LINDEMAN, purchasing agent of Northern Indiana Public Service Co., Hammond, Ind., has retired after 45 years of service with the company.

WILL J. CHAPPELL has been appointed to the newly created post of general product sales manager of Bryant Manufacturing Co., Indianapolis. Most recently he has been product sales manager.

Two new sales divisions, eastern and western, have been set up by Minneapolis-Honeywell's industrial division. J. T. TEED heads the eastern division, working out of Philadelphia, and T. W. TRACY heads the western division with headquarters in Los Angeles.

What's Briggmann looking at?

George Briggmann, UNION CARBIDE's specialist in the use of CARBOSEAL Anti-Leak, is inspecting another bell-and-spigot joint effectively sealed with CARBOSEAL Anti-Leak. Municipal gas companies have found CARBOSEAL Anti-Leak the answer to problems resulting from the changeover from wet manufactured gas to dry natural gas.

CARBOSEAL Anti-Leak swells dried out packing fibers in bell-and-spigot joints—thus, it solves four problems because it:

- *corrects leakage*
- *eliminates vegetation damage*
- *reduces maintenance costs*
- *wets down dust and rust in mains*

CARBOSEAL Anti-Leak solves these problems easily and economically too. And, it has kept joints tight for up to 23 years.

Get full details on CARBOSEAL Anti-Leak. Write for booklet 4506. A 16 mm. color-sound movie, "CARBOSEAL Anti-Leak Stops Gas Main Leakage" is available upon request. Better yet, give George a call. He'll be glad to tell you how CARBOSEAL Anti-Leak can mean increased profits for you.

CARBOSEAL ANTI-LEAK

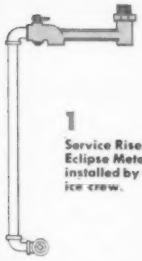
Union Carbide Chemicals Company
Division of Union Carbide Corporation
30 East 42nd Street, New York 17, N. Y.
In Canada:
Union Carbide Canada Limited, Montreal.

"Carboseal" is a registered trade-mark of Union Carbide Corporation.

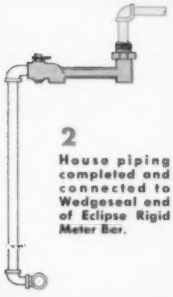
New... *Wedgeseal* insulated unions

Here's how you can set meters for life...with

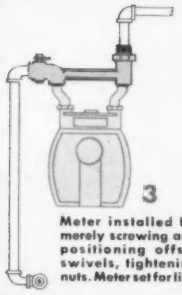
ECLIPSE RIGID METER BARS



1 Service Riser and Eclipse Meter Bar installed by service crew.



2 House piping completed and connected to Wedgeseal end of Eclipse Rigid Meter Bar.



3 Meter installed by merely screwing and positioning offset swivels, tightening nuts. Meter set for life!

You can simplify and standardize the installation of tin, iron, or aluminum case meters for life by using Eclipse Rigid Meter Bars with Wedgeseal insulated unions. These new, one-unit meter bars give you a "focal point" from which, and to which, to work. They reduce the number of fittings and eliminate "bridging the gap" (left by service crew or plumber) in meter hookups. Piping alterations are eliminated on periodic meter changes. Eclipse *Wedgeseal-Insulated* Rigid Meter Bars offer the simplest and most economical way to install meters, to insulate mains and services from stray or induced house currents.

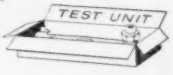
NEW WEDGESEAL UNION OFFERS COMPLETE, PERMANENT INSULATION—Integral Zytel 105 union insulator has exclusive "wedge" design — prevents jumping — eliminates shearing action between nut and tailpiece. There is no assembly — no chance of the insulator being left out — no metal-to-metal contact — no shorting. Withstands 350 ft lb applied torque — takes all strains imposed by house and service piping — is not affected by manufactured, natural, or LP gas. Eclipse Rigid Meter Bars with Wedgeseal Insulated Unions are available with or without integral gas cocks. Use the coupon below to obtain your free test unit.

WEDGESEAL UNIONS AVAILABLE for many insulating applications — ⅛, ¾, 1, and 1¼ in. sizes now in production, with larger sizes to follow.

Eclipse®

GAS COCKS and METER BARS

Send for free WEDGESEAL meter bar — see Bulletin P-1 for style number and connection sizes desired.



ECLIPSE FUEL ENGINEERING COMPANY
1109 Buchanan Street, Rockford, Ill.
Eclipse Fuel Engineering Co. of Canada, Ltd.
20 Upjohn Road, Don Mills, Toronto, Ontario

Please send No. ....., ...x.....x..... for ( ) tin, ( ) aluminum, or iron case meters to:

NAME.....

COMPANY.....

STREET.....

CITY.....STATE.....

STOP H_2S CORROSION BEFORE IT STARTS!

The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

CONNELLY

Incorporated

3164 S. CALIFORNIA AVE.

CHICAGO 8, ILLINOIS

Elizabeth, New Jersey

people • *Continued*

E. D. ANDERSON has been promoted to superintendent of production in charge of Lone Star Producing Co. personnel in the production department. JACK GOURLEY, as assistant chief engineer, will aid the chief engineer and supervise Lone Star Gas Co. personnel and work pertaining to the department.

JAMES W. SMITH, sales engineer for Sprague Meter Co. in Tulsa for seven years, has transferred to Kansas City, Mo. His new territory covers Missouri, Kansas, Nebraska, Colorado, northern Oklahoma and southern Wyoming. RAY FOGELMAN, sales engineer in Sprague's Houston office, will cover southern Oklahoma.

WILLIAM P. GLANCY has been appointed head of the payroll department of Peoples Natural Gas Co., Pittsburgh.

HARRY H. FITZGERALD and LEONARD MILANO have been elected vice presidents of Commonwealth Services Inc. Mr. Fitzgerald is in charge of the Houston office.

HAL MERKEL has been named sales manager of heating and air conditioning products for the Permaglas division of A. O. Smith Corp., Kankakee, Ill.

WILLARD A. BURNETT is chief accountant in the comptroller's department of Public Service Electric & Gas Co., Newark, N. J. He succeeds LEWIS R. FAY, recently named assistant comptroller.

LOUIS E. BOLIVER has been appointed personnel manager of the Peoples Natural Gas Co., Pittsburgh. He will be assisted by JOHN H. CLAY JR.

James W. Smith
Sprague Meter

Louis Boliver
Peoples Natural

FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads, tracks, lawns with a timesaving

GREENLEE HYDRAULIC PUSHER

Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.

Two feet per minute average pushing time

GREENLEE Pushers are available in two sizes: No. 790 for ¾" to 4" pipe . . . No. 795 for pipe over 4", concrete sewer pipe, large ducts. Average performance of No. 790, shown above with power pump, two feet per minute. Write for literature.

GREENLEE

GREENLEE TOOL CO.
Division of GREENLEE BROS. & CO.
1952 Columbia Avenue, Rockford, Ill.

EDWIN T. GOREE has been promoted to assistant general sales manager of Bucyrus-Erie Co., South Milwaukee. He has been assistant sales manager, excavator distributors, since 1955.

Several promotions have been announced by Brooklyn (N.Y.) Union Gas Co. CHARLES L. NEUMEYER is now manager of the company's rate department; LUKE P. MULVEHILL is assistant district manager of the commercial offices in Queens; and ALFRED W. VAN DUSEN is now a supervisor on the manager's staff.

HARRY RAYSON LESTER, Saskatchewan Power Corp.'s northern area gas superintendent for the past year and a half, has been promoted to head the provincial gas distribution division. As gas distribution superintendent, he will supervise all gas distribution systems in Saskatchewan.

CLIFFORD D. MOHR, chief engineer, has been appointed assistant sales manager of Gaffers & Stattler, division of Utility Appliance Corp., Los Angeles.

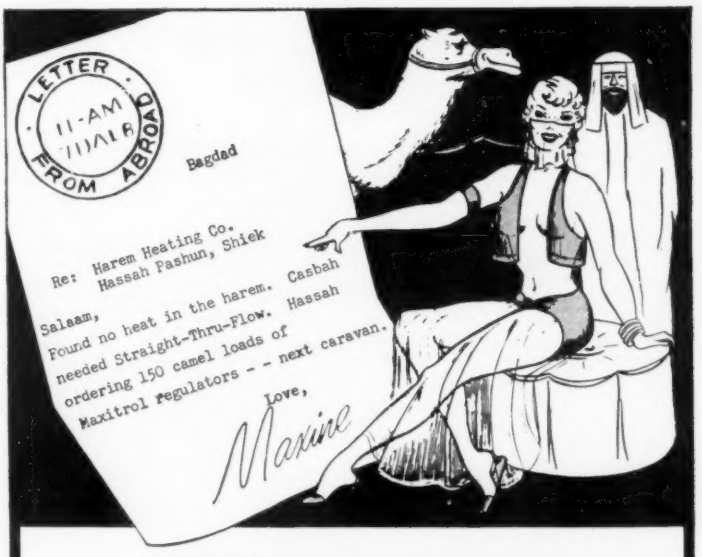
DUANE V. KNIEBES has been promoted from head of the analytical division to assistant research director of the Institute of Gas Technology, Chicago. He will be responsible for research activities in IGT's analytical division and the computer laboratory.

PAUL F. BRUNING has been appointed vice president in charge of the manufacturing, heating and air conditioning plant of Holly-General Co. in Pasadena, Calif.

BRUCE A. MCCANDLESS, most recently assistant managing director of the AGA, has joined Milwaukee (Wis.) Gas Light Co. as vice president in charge of sales. Mr. McCandless served at the AGA's Cleveland Laboratories from 1939 until 1952, rising to the post of

Duane Kniebes
IGT

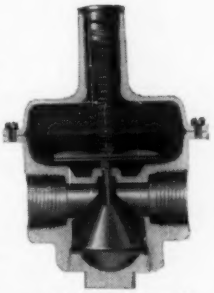
Bruce McCandless
Milwaukee Gas



IMPROVE MANIFOLD DESIGN LOWER COMPONENT COST

Heating harem beauties is only one application where "Straight-Thru-Flow" can improve burner manifold design. Pressure drop is reduced by letting the gas flow "Straight-Thru" the regulator. This results in greater capacity and allows greater MANIFOLD DESIGN FLEXIBILITY. Results: Smaller diameter pipe; smaller, cheaper manifold components.

Why not write Maxine for a run-down on the construction features and advantages of "Straight-Thru-Flow."



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MAXITROL COMPANY

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DETROIT 39, MICH.

NOW! *LOW-COST PROTECTION* AGAINST ELECTROLYSIS!

MAYCO
Dielectric Couplings and Unions

MAYCO Dielectric Fittings are fitted with tough nylon Mayco Bushings able to withstand 230° F. and pressures up to 1000 lbs. They've been proven by thousands of mechanics and manufacturers who have used millions. Protection is positive . . . price is low enough to warrant use whenever dissimilar metals are joined. Ask your jobber.

Straight Couplings

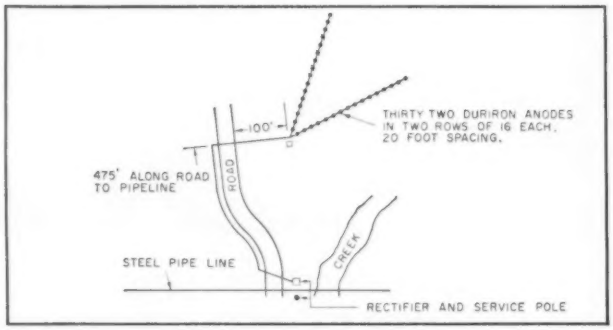
Solder Unions

MAY COMPANY Galesburg, Illinois
Makers of Famous Mayco Dielectric Bushings

32 DURIRON® ANODES

protect 11,000 feet of steel water line without backfill

The Problem: An isolated section of 11,000 feet of steel water line needed cathodic protection. Tests showed current requirements to be 40 amps., but replacement of adjacent wood stave lines called for extra capacity. Ground was a peat bog with water table standing at 6 inches below surface, making backfill methods impossible.


100'
THIRTY TWO DURIRON ANODES IN TWO ROWS OF 16 EACH, 20 FOOT SPACING.
475' ALONG ROAD TO PIPELINE
ROAD
CREEK
STEEL PIPE LINE
RECTIFIER AND SERVICE POLE

The Installation: 32 Duriron Anodes (2" x 60") were installed without backfill, by digging through the dry surface and then pushing anodes down until the tops were 3 feet below surface. Anodes were installed 20 feet apart, in two rows, with a calculated resistance of one ohm, based on previous experience with similar installations. While conventional backfill columns would have reduced the number of anodes necessary, the use of bare anodes constituted a major saving in cost.

The Performance: The anode bed is discharging 60 amps. at a terminal voltage of 59 volts. The entire line section is under protection, the minimum potential being 1.18 volts. This affords ample margin to handle prospective additions to the line. Agreement between actual and calculated anode resistance is quite close.

Action: For further information on this particular installation or for technical assistance on other Duriron impressed current anode installations, write:

DURCO — CORROSION RESISTING ALLOYS & EQUIPMENT

THE DURIRON COMPANY, INC.
DAYTON 1, OHIO

CLIP THIS AND MAIL TODAY
if you have not subscribed to . . . **GAS**

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Standard Rates Apply to U. S. & Possessions

☐ Check herewith ☐ Bill me ☐ 2 years $3.00 ☐ 1 year $2.00

Name _____ Title _____

Firm _____

Street _____

City _____ Zone _____ State _____

people • *Continued*

assistant to the director. He transferred to New York then as assistant to the managing director.

Consolidated Edison Co. of New York has elected R. FRANK BROWER and JOHN V. CLEARY as vice presidents. The company's board of trustees also elected EMANUEL TODER as controller, RALPH F. NORRIS as assistant vice president, and JOHN D. GRAY as assistant treasurer.

KEN WEAVER has been appointed northern district manager for Cascade Natural Gas Corp., Seattle. The district includes company operations in Bellingham, Burlington and Anacortes, with headquarters in Bellingham.

NICK V. KOSTOFF has been promoted by Reilly Tar & Chemical Corp., Indianapolis, to technical services representative. He will cover the southwestern district.

JOSEPH S. JONES, legal counsel for Mountain Fuel Supply Co., Salt Lake City, has been elected a director of the company. He succeeds the late WILLIAM W. RAY.

JOHN C. BOLINGER JR. has been elected president and director of East Tennessee Natural Gas Co., Knoxville. Prior to his election by East Tennessee, Mr. Bolinger had been assistant to the president of Mississippi River Fuel Corp. and vice president and director of subsidiary operations of Mississippi River Fuel. He succeeds GUY T. HENRY as president of East Tennessee. Mr. Henry, who became president of Providence (R.I.) Gas Co. on Sept. 1, continues as a member of the board of directors of East Tennessee Natural.

RICHARD L. LIGHTSTONE has joined the instrument division of Robertshaw-Fulton Controls Co. as sales engineer.

Rockwell Manufacturing Co., Pittsburgh, has promoted five sales officials to new sales management posts. The men have all been named assistants to Herman Gottwald, assistant vice president and product manager-Nordstrom valves. They are: THOMAS I. STACY, former Houston district sales manager, now assistant product manager-transmission line valve sales;

step up
water heater
sales and
dependability!

ROBERTSHAW-GRAYSON CONTROLS

UNITROL 400
"The modern look"... a prestige control for prestige water heaters where you must justify a higher price to the customer. Features a greater capacity, 99,000 (natural gas) BTU per hour!

UNITROL 200
Four controls in one ... smart appearance enables you to trade up from the price leader class to a higher profit medium-priced bracket.

UNITROL 110
Pilot gas cock, main gas cock, thermo-magnetic, 100% automatic shut off of pilot and main burner, snap action thermostat, pilot adjustment and pilot gas filter ... all in one unit, attractively packaged in a new hard-baked gray enamel finish!

You can step up your water heater sales volume at every rung of the ladder from low priced leaders to higher priced, profit-packed, prestige models.

Start with the economy and dependability of the smart-looking UNITROL 110...step up to the more attractive UNITROL 200 for medium-priced water heaters... and then to the top for "the modern look" of the new UNITROL 400!

A point to remember—when you sell a prestige water heater, overall appearance and dependability *must* justify the extra cost! Start with the control!

Specify Robertshaw-Grayson controls from the bottom to the top!

Robertshaw-Fulton
CONTROLS COMPANY
GRAYSON CONTROLS DIVISION • LONG BEACH, CALIFORNIA

New HIGH·····POWER
·····TORQUE
Air MOTORS

. . . ample power to rip through tough roots and earth formations . . . full speed and torque right up to stalling point . . . safer to operate than engine or electric drives.

FASTER Pipe Installation
LESS WASTED TIME

WRITE FOR BULLETIN
HYDRAUGER*
*REG. U.S. PAT. OFFICE

HYDRAUGER CORP, LTD.
681 MARKET STREET
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HY-33A

Another SOUTHERN MILL Prefabricated Home
Designed for Gracious Living

Smart and Comfortable

Here is one of the many variations of design possible with the basic STURDYBILT two bedroom home. Shake shingles or Johns-Manville asbestos siding may be used. For homes to provide comfort and contentment of employees investigate STURDYBILT Prefabricated Homes.

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA.

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

people • *Cont'd.*

RICHARD E. MILLER, former gas sales supervisor in the New York district, now assistant product manager-valve lubricants and accessories; JACK W. HARRIS, former Houston senior sales engineer, now assistant product manager-refinery and chemical valve sales; JOHN R. APPLEGATE, former Chicago senior sales engineer now assistant product manager-utilities valve sales; and CLYDE H. CHRONISTER, former Tulsa senior sales engineer, now assistant product manager-production valve sales.

WILFRED S. GAUTHIER has been appointed Cribben & Sexton factory manager in charge of manufacturing operations at all three company plants—Chicago, Michigan City (Ind.), and Independence (Kan.). He has been with Cribben & Sexton since 1944 and has been a plant superintendent during the last seven years.

RALPH LARSEN has been appointed northern California representative of the Gaffers & Stattler and Occidental divisions of Utility Appliance Corp., Los Angeles.

ROBERT L. SWANK has been appointed manager of sales-plastic pipe for National Tube Division of United States Steel, Pittsburgh. Newly appointed assistant manager is THOMAS D. CRAMER. Mr. Swank, who has been with the company since 1946, succeeds ROBERT K. HENDERSON, newly appointed National Tube district sales manager in Philadelphia.

ROBERT B. HERROLD has been promoted to assistant treasurer in charge of customers accounting and collecting for the Ohio Fuel Gas Co., Columbus. He succeeds HARRY S. HAHN, who has retired.

L. S. BALDWIN, S. R. FLEMING, and W. O. JOHNSON have been

Robert Herrold
Ohio Fuel

Paul E. Richard
L. B. Foster Co.

elected vice presidents of Ford, Bacon & Davis, New York. Mr. Fleming was also elected vice president of Ford, Bacon & Davis Canada Ltd., a wholly owned subsidiary.

C. H. SWANSON has been named named sales manager of LPG sales for Anchor Petroleum Co., Tulsa. He was formerly district manager of LPG truck sales in Oklahoma.

PAUL J. W. MILLER, secretary of Rochester (N. Y.) Gas & Electric Corp., has retired after more than 43 years with the company. He started with the company as a clerk in 1914 and later became assistant to general bookkeeper, assistant general bookkeeper, accountant, office manager, assistant secretary, and in 1951 secretary of the company.

RAYMOND B. JOHNSON has been added to the sales staff of the New York office of L. B. Foster Co. as a specialist in pipe sales. Staff additions in the Los Angeles office include N. KERRY PATTERSON and PAUL E. RICHARD. Mr. Patterson will specialize in highway product sales and Mr. Richard in tubular products sales.

ARTHUR J. HARTMAN has been named purchasing agent of Northern Indiana Public Service Co., Hammond. He is succeeded as assistant purchasing agent, a post he has held since 1937, by JOSEPH H. WAXMAN, the company's traffic manager.

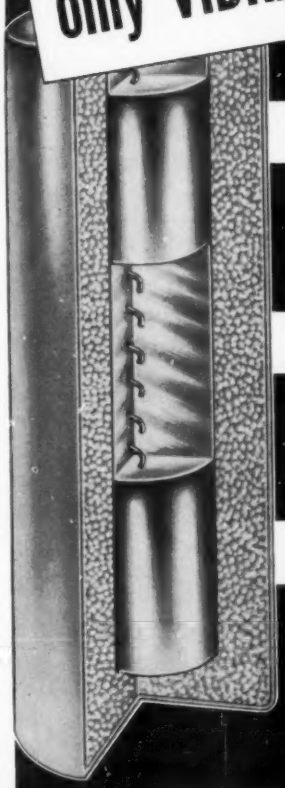
Several regional appointments have been made by the ElectroData division of Burroughs Corp., Pasadena, Calif. ROBERT E. TODD is New York district field engineering manager, JAMES FORD is central regional manager, JOHN T. ALLEN is field engineering supervisor in the Dallas district, and FRANK C. MEARS is field engineering supervisor in Los Angeles.

(*Continued on page* 88)

Raymond Johnson
L. B. Foster Co.

N. Kerry Patterson
L. B. Foster Co.

only VIBRA PAK anodes give



QUALITY

through positive quality control via the Quantometer which accurately analyzes magnesium within .0001% assuring exact specifications on your anodes.

DEPENDABILITY

a vigorous research program, plus years of magnesium anode experience in application and manufacture mean a dependability of product unmatched anywhere.

LONGER LIFE

lower initial cost plus the exclusive VIBRA PAK features mean greater operating efficiency, and a more active, longer anode life.

QUALITY AND DEPENDABILITY THROUGH RESEARCH

Standard Magnesium Corporation
TULSA, OKLAHOMA

MAGNESIUM ANODES • MAGNESIUM INGOT • MELTING FLUX

100% Sales Acceptance on FREE Trial Offer

of the all new Fisher "Electronic Witch" M-SCOPE Pipe Finder

10 DAYS FREE TRIAL

In your field, 100% of those who take the famous "Electronic Witch" on FREE TRIAL actually purchase it! Here is absolute proof of unsurpassed performance. Outperforms any pipe locator on the market regardless of price. Test this new Pipe and Cable Finder under YOUR actual working conditions. State on your company purchase order that you want 10 day FREE TRIAL OFFER. Your only expense is the nominal shipping charge.

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with Indestructible Fiberglas cabinets.

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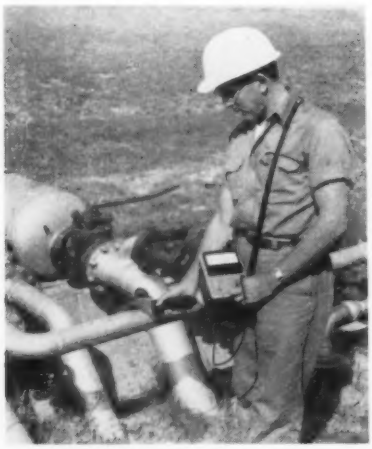
Send for FREE 1958 CATALOG Complete Pipe Finding, Leak Detecting and Corrosion Control Equipment.

Gas Digest

A digest of what's new in products and trade literature compiled by the editors of GAS as a reader service.

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 85, 86



1. Pipe wall gauge

The AccuRay portable pipewall thickness gauge from Industrial Nucleonics permits quick, easy, nondestructive pipewall thickness measurements. The transistorized gauge measures absolute thickness directly on pipes ranging from 2 to 8 in. nominal in diameter. The measurement unit, which gives a reading independently of pipe diameter, maintains a permanent calibration.
Industrial Nucleonics Corp.

2. Backhoe

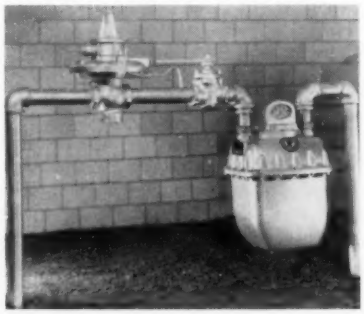
Problems of digging in frozen earth are overcome by Ottawa's Big Muscle backhoe. The heavy structure of the backhoe pays off in starting a trench in frozen ground, where if too much pressure is exerted by the lift cylinder it takes the weight away from the outriggers and allows the machine to slide backward. The bucket teeth have sufficient penetration without exerting enough down pressure to lighten the outriggers.
Ottawa Steel Division

3. Gas dryer

Stiglitz Corp.'s new Imperial gas dryer features an ultra violet sun lamp to give fresh, sunny fragrance to finished work. The Imperial, a Stiglitz Sun-Aire dryer, has a burner that turns off five minutes before the drying cycle is completed. The clothes are finished with cool air.
Stiglitz Corp.

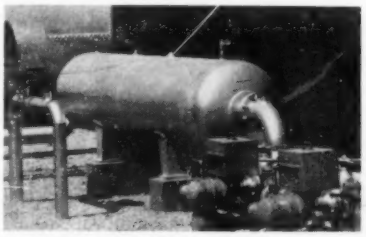
4. Transistors

A new carrier-current transmitter, fully transistorized, is now being furnished by General Electric's communications products department. The new crystal-controlled transmitter can be operated on any specified frequency from 30 to 200 kc. Designated Type CT-50B, the new unit supersedes the Type CT-20 transmitter.
General Electric



5. Light-weight meter

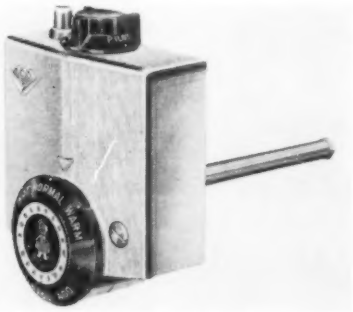
A new light-weight, single-joint aluminum gas meter from Rockwell has been designed primarily for commercial and industrial services requiring large capacity at low working pressure. The 47-lb meter, Type 750, has a 15-psi working pressure and a capacity of 750-cu ft/hr at ½-in. differential.
Rockwell Manufacturing Co.



6. Pulse trap

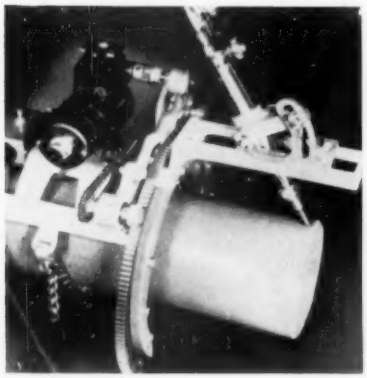
Everett pulse traps reduce pulsations in hydraulic systems, oil lines, gas or refrigerant piping. The operation of the trap includes a divided flow principle which not only attenuates the pulsations, but cancels the pulsation of the two di-

vided streams, which are forced out of phase.
Pulsation Controls Corp.



7. Three-in-one control

Several design improvements have been made in Robertshaw's Unitrol 400, deluxe three-in-one control for gas-fired water heaters. Changes include restyled appearance. As another improvement, operation of the temperature knob was changed so that it remains flush with the cover plate as it turns. Settings are visible from a standing position when the control is mounted at the base of the water heater.
Robertshaw-Fulton Controls

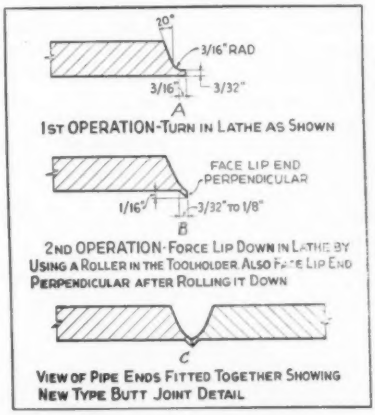


8. Motorized beveler

H&M Pipe Beveling Machine Co. is now making a motorized machine that provides completely automatic operation in cutting and beveling on pipe ranging in size from 1½ in. to 36 in. The unit can be attached to any one of H&M's seven standard machines. Switching from manual to automatic operation is made easy by the quickly detachable mounting bracket.
H&M Pipe Beveling Machine Co.

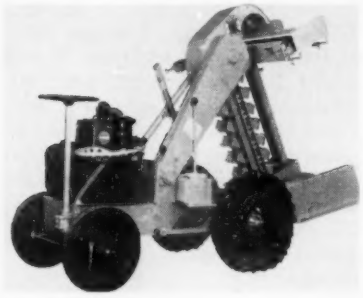
9. Gas water heater

Ruud's new line of residential automatic gas water heaters features copper-nickel alloy tanks. Each unit in the Superspeed series is designed for operation with all gases. The solid copper-nickel alloy used to produce the water heaters has been time-proven under rigorous conditions. Three of the units are available with Ruud's duo-temp features.
Ruud Manufacturing Co.


20°
3/16" RAD
3/16"
3/32"
A
1ST OPERATION-TURN IN LATHE AS SHOWN
FACE LIP END PERPENDICULAR
1/16"
3/32" TO 1/8"
B
2ND OPERATION-FORCE LIP DOWN IN LATHE BY USING A ROLLER IN THE TOOLHOLDER. ALSO FACE LIP END PERPENDICULAR AFTER ROLLING IT DOWN
C
VIEW OF PIPE ENDS FITTED TOGETHER SHOWING NEW TYPE BUTT JOINT DETAIL

10. Welding technique

An arc-welding process which eliminates the need of metallic backing rings or inserts when welding butt joints in pressure piping systems has been developed by Stone & Webster. Major feature of the technique is the manner of preparing the root edges of the joint. Root edges are bent to produce an internal circumferential lip.
Stone & Webster

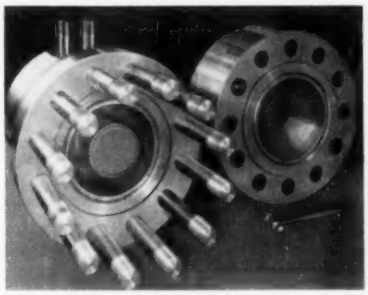


11. Trencher

A new trencher for service lines and footings is available from Charles Machine Works. The Model LD is completely mobile with trenching speeds up to 8 ft/min. and road speeds up to 5 mph. Standard trench widths are available from 4 in. to 16 in. at 2-in. intervals.
Charles Machine Works

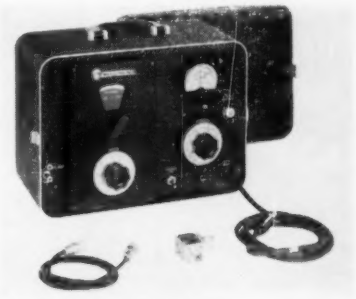
12. Air conditioners

Ideal year-round comfort is assured in every room of large split-level homes by American-Standard's two completely independent air conditioning systems. One system provides winter heating and summer cooling to the upper level — the other system provides the same comfort to the lower level. Each system is controlled by an independent heating-cooling thermostat.
American-Standard



13. Purifiers

V. D. Anderson's new line of purifiers has been designed primarily for use in high pressure applications. They withstand pressures up to 15,000 psi for air, steam and process vapor and gas lines. Pressure parts in the new line are of special alloy steel with special gaskets and pipeline connections.
V. D. Anderson Co.



14. Signal generator

Designed especially for servicing land mobile communications systems is Motorola's new laboratory standard RF signal generator. It presents complete coverage of all land mobile communications bands presently used for two-way mobile and base station radio operations.
Motorola Inc.

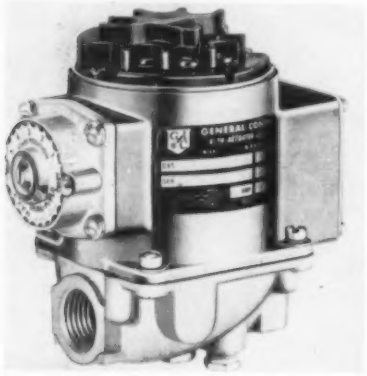
15. Tapered orifice valve

The tapered orifice valve offered by General-American Valve Co. reportedly offers a radically new concept of flow control. By moving a plug with a tapered slot into and out of a circular opening, the flow of fluid or gas is controlled by the

area of the tapered slot at the head of the opening. A circular sealing ring eliminates bypass.
General-American Valve Co.

16. Combination valve

The need to install and wire a separate pilot safety control is eliminated with Minneapolis-Honeywell's new combination gas valve and automatic pilot safety control. The Pilotstat is attached in a separate casting to the upstream side of the gas valve. In addition to housing the switch-type Pilotstat assembly, the casting — depending on model—contains a pilot filter, B cock, pilot gas flow adjustment and 100 per cent shutoff.
Minneapolis-Honeywell

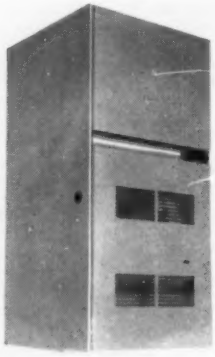


17. Valve

Valve performance can be tailored to exact requirements by merely setting the dial on General Control's new K-3H Hydranoid valve. "Dial-a-Flo" has been incorporated on the K-3H valve. For quiet ignition, elimination of roll-out and attendant pilot outage, the new valve opens to the adjustable, preset start position thereafter continuing to open slowly until satisfactory burner operation is established.
General Controls Co.

18. Process lining

Protection against corrosion is claimed by a new process lining which protects copper and other metal tubing. It protects against corrosion and prevents contamination of liquids or gases passing through it. This is accomplished by the inseparable bonding of an impervious pure fused tin lining to the copper. M/L tubing may be bent, cut, flattened, flared, soldered or continuously heated to over 300°F without destroying the protective lining.
Myron L. Co.



19. Warm air furnaces

Coleman has added three models to its Trim-Boy line of gas-fired warm air furnaces. Largest of the three is a 165,000-Btu up-flow model. Both up-flow and down-flow types are offered in new models rated at 135,000 Btu. The new furnaces are designed for efficient operation with perimeter, conventional, or small-pipe systems, including the manufacturer's 3½-in. Blend-Air system.
Coleman Co.

20. Remote control unit

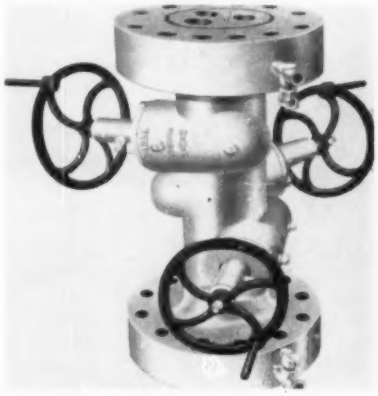
Motorola's new remote control console extends the control function of any remotely located 2-way radio base station to the dispatcher's office over two- or four-wire lines. The all-metal housing has provisions for 13 controls on the front panel. These 13 positions may be utilized for one or more of the "kits" available to meet the needs of the radio dispatcher.
Motorola Inc.

21. Multiple receiver

Up to 10 different frequency tone signals can be selected and tested by Hammarlund's new multiple receiver unit. The new unit, MRU-2, provides both pilot light indication and a display of a meter quantity. It is designed primarily for use in a central station for scanning up to 10 incoming audio tone signals. It may also be used as an emergency standby receiver in case of a regular tone receiver failure.
Hammarlund Mfg. Co.

22. Gas water heater

A recovery rate of 58.8 gal./hr (60° rise) is offered in the new Mission Diamondglas Supreme gas water heater. To match performance with beauty, the new model is styled with smooth flowing lines (all controls are concealed in 30- and 40-gal. sizes); copper-tone finish (or white enamel if preferred); and chrome top and skirt.
Mission Appliance Corp.



23. Triple valve

For use on triple completion Christmas trees, W-K-M's new triple valve has three 2-in. through-conduit gate valves in a single body. The new valve is available in six models with API working pressures of 2000, 3000, and 5000 psi and 8- and 10-in. flanges.
W-K-M Division

FOR MORE INFORMATION

about New Products in this Issue . . . . .

Each New Product or Trade Literature item reviewed in this issue is numbered. Circle the corresponding numbers on the Readers' Service Card; then PRINT your name, title, company and address plainly and drop the card in the mails (no postage is needed).

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24. Commercial ranges

Castle is the name of a new line of commercial gas ranges, ovens and griddles from Comstock-Castle Stove Co. One of the new features of the range is the giant oven — 30 in. wide by 22 in. deep.
Comstock-Castle Stove Co.

25. Pipe tool

Oster's new one-man power drive for hand pipe tools can be mounted in a variety of ways to fit every need. The "100" has a full 2-in. standard pipe range and up to 12-in. diameters using a special drive unit and geared tools. In addition to the hinged, folding stand, the machine can be bolted directly to work bench or clamped on a truck, bench or other suitable mounting.
Oster Manufacturing Co.

TRADE LITERATURE

26. Pipe coating

Facilities for cleaning, coating and wrapping pipe in sizes from ¾-in. through 12-in. are described in a brochure from Southern Pipe Coating. The eight-page, four-color bulletin shows various stages in the wrapping process and describes the holiday detection test and other controls used in the plant.
Southern Pipe Coating Co.

27. Shutoff valve

A new quick acting, shutoff valve for gas, air, water or oil service is described by Homestead Valve in Bulletin 39-8. Applications, specifications, and parts are discussed and illustrated.
Homestead Valve Mfg. Co.

28. Instrument accessories

Complete information on industrial instrument accessories and supplies has been compiled in a 60-page catalog from Foxboro. The loose-leaf book Catalog 500, includes specifications, parts numbers and prices for more than 250 instrument parts and supplies.
Foxboro Co.

29. Air compressors

Photographs and specifications of Le Roi's complete line of portable air compressors, both reciprocating and rotary, are presented in a new eight-page bulletin.
Le Roi Division

30. Gas ranges

O'Keefe & Merritt's current ranges are discussed in two brochures. One an eight-page, four-color catalog, includes photos and descriptions of 11 current models, together with photos and complete descriptions of 16 of the most important features. Also available is a revised brochure on built-ins.
O'Keefe & Merritt Co.

31. Test hole unit

A new bulletin from Heath Survey describes the company's A-T-I permanent leakage control test hole assembly for use in downtown or other paved areas. Cutaway drawings show construction of the unit, which is self-sealing against dirt, and relative location in conjunction with gas mains.
Heath Survey Consultants

32. Rotary compressors

Component parts of its new Hydrovane rotary compressors are shown in Davey Compressor's new bulletin. Among features stressed is accessibility for inspection or repair. Illustrations include cut-away photos taken from directly below the unit and sectional views of each side.
Davey Compressor

33. Joining pipe

An illustrated bulletin describes the Vic-Easy method of joining thin wall steel and aluminum pipe and tubing. Details of the system and applications for which the method is suitable are presented. Three different couplings and their uses are discussed.
Victaulic Co. of America

34. Heat exchanger

A design and cost booklet on its heat exchangers has been published by Wolverine Tube. The illustrated catalog gives analysis of comparable costs.
Wolverine Tube

35. Electrode guide

A new 70-page electrode pocket guide contains information essential to those concerned with buying or using electrodes. In its guide, Air Reduction offers an electrode consumption calculator, in tabular form.
Air Reduction Co.

36. Safety controls

"Basic Safety Controls for Low Pressure Steam Boilers" is the title of a new bulletin from McDonnell & Miller. In addition to presenting basic facts about steam boilers, the publication tells the why-and-how story of McDonnell products.
McDonnell & Miller Inc.

37. Temperature measuring

Details on two basic types of fast-reading, metal-probe thermometers are presented in a folder from Royco Instruments. It also shows the various configurations in which they are available.
Royco Instruments

38. Industrial burner

A new 12-page catalog from Coen Co. describes the company's Fyr-Compak industrial burners for gas or oil or combination firing. Installation photos illustrate the publication.
Coen Co.

39. Ball valves

Jamesbury Corp. has published a comprehensive catalog covering its line of double-seal ball valves. Among products described is the company's PVC ¼- to 2-in. ball valves with screwed, flanged, or weld ends. They have been designed for use with normal or high impact PVC or other plastic piping.
Jamesbury Corp.

RIGHT on the LINE

HAYS STOPS FOR

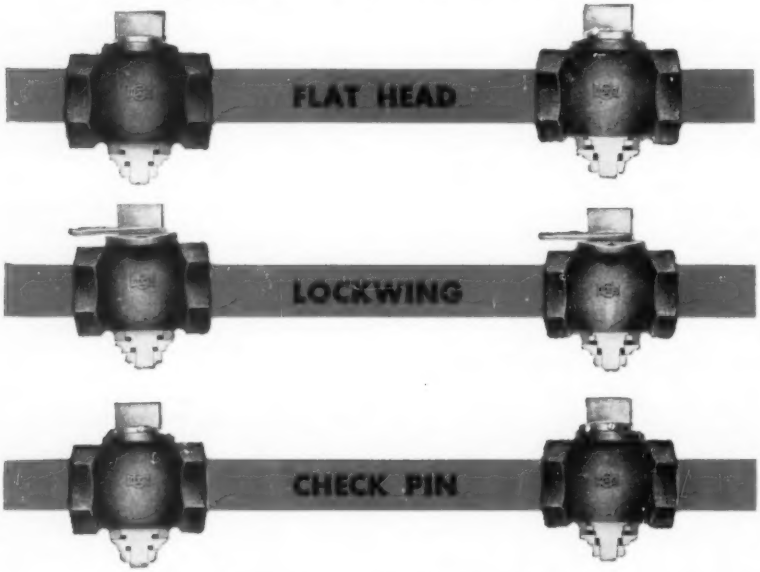
SERVICE LINES • METERS • APPLIANCES

REGULAR PATTERN

"KEY-LOK" TAMPER PROOF

Full Range of Sizes

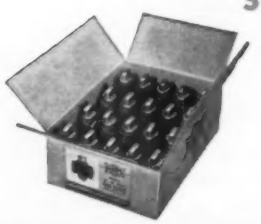
Iron Body with Brass Plug ... Black or Galvanized



Quality Assured — By Precision Machining ...
Individual Testing ... Rigid Inspection

Quality Proven by Supplying the Gas Industry for Over 80 Years

Hays also manufactures a full line of all brass stops



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Another Hays First

for Easy Handling ...
Space Saving Storage

Write for Literature or ask "The Man From Hays"

GAS SERVICE PRODUCTS

HAYS MANUFACTURING CO.

ERIE, PA.

people • *Continued*

(*from page* 81)

BERNARD B. FERGUSON, JR., formerly vice president, has been elected vice president and general manager of the Portsmouth (Va.) Gas Co. At the same time, the company elected ROBERT W. JOHNSON, formerly assistant secretary-treasurer, to the post of secretary and treasurer.

A. O. Smith Corp.'s Permaglas division has named three new sales supervisors. They are: DICK CLARK in the Albany, N. Y., Connecticut and western Massachusetts area; LEE CORNELL in the eastern Pennsylvania, Baltimore, and Washington areas; and LEE ZOECKLER in the Chicago metropolitan area. JACK POHLE, who formerly covered Colorado, has an extended area including Montana and Utah.

CHAMPION M. DAVIS, retired president of the Atlantic Coast Line Railroad; WILLARD P. BALDWIN, vice president and treasurer of Tidewater Gas Co.; and JOHN C. BONEY, owner of the Carolina Gas Co., have been elected directors of the Tidewater company, Wilmington, N. C.

ROBERT W. RAY, J. V. DEAN, and R. A. BEDAU have been appointed regional sales managers of Tamco Corp., San Rafael, Calif. Mr. Ray, with headquarters in Petaluma, Calif., will manage the northwestern Rocky Mountain area, excluding Colorado; Mr. Dean, headquartering in Los Angeles, will cover southern California, Arizona, and New Mexico; and Mr. Bedau, operating out of Muskegon Heights, Mich., will cover Michigan, Wisconsin, Illinois, Ohio, Indiana, and Kentucky.

JACK H. MIKULA is now industrial development and utilization engineer for Michigan-Wisconsin Pipe Line Co. He has directed sales of Milwaukee Gas Light Co. since 1954. His department will assist 16 gas distributing companies in their industrial development programs.

CHARLES S. PALMER has been appointed wage and salary administrator for the Peoples Natural Gas Co., Pittsburgh.

AMOS PERSONS, manager of Southern Union Gas Co.'s distribu-

tion plant at Santa Fe, N. M., has transferred to Farmington, N. M., as transmission superintendent. He fills the vacancy created by the death of VARS W. BATES.

M. D. LA GRONE has been named vice president and treasurer of Consolidated Gas Utilities Corp., Oklahoma City. Since 1955, Mr. La Grone has been manager of rate, valuation and regulatory matters for Arkansas Louisiana Gas Co.

JESS E. HENDRICKS has joined the executive staff of Coastal States Gas Producing Co. as manager of operations.

HERBERT H. BLOOM, former president of Massey - Harris - Ferguson Inc., has been elected president of J. I. Case International S. A., a new wholly owned subsidiary of the parent company. J. I. Case has also elected T. A. HALLER to the newly created position of vice president in charge of engineering. He has been director of engineering for the industrial division since Case merged with American Tractor Corp. earlier this year.

Deaths

DAVID M. BARRETT, 46, industrial and commercial sales manager for Washington Natural Gas Co., Seattle, died recently. Just the day before his death, Mr. Barrett had been promoted from industrial sales manager. He joined Washington Natural in 1956. Before that he was industrial sales supervisor for Washington (D. C.) Gas Light Co.

FRED J. RUTLEDGE, a retired vice president of the United Gas Improvement Co., Philadelphia, died recently. He was 83 years old. Mr. Rutledge joined UGI and Philadelphia Gas Works in 1909 and retired in 1941.

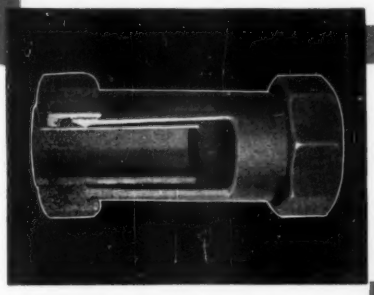
CHARLES BOLLINGER, 84, active with American Meter Co. until recently, died in September at his home in Shaftsbury, Vt. Mr. Bollinger joined American Meter in 1898 in Albany, N. Y. He was transferred to New York City in 1925.

CLAUDE A. WILLIAMS, founder and former president of Transcontinental Gas Pipe Line Corp., was killed in an automobile collision in October. Mr. Williams, 53, resigned as president of Transco in 1953.

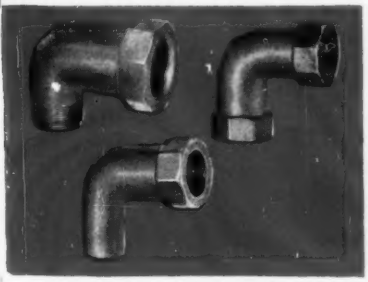
NORMAC

Couplings, Sleeves and Fittings for ☆ UNIFORMITY ☆ DEPENDABILITY ☆ ADAPTABILITY

Normac gas distribution products are engineered and manufactured to meet every requirement of modern gas distribution. Write today for catalog.

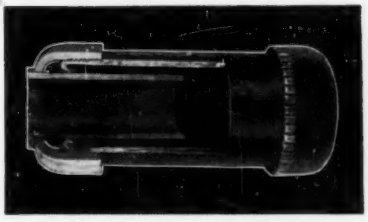


NORMAC COUPLINGS
Normac malleable couplings and sleeves offer the ultimate in deflection and strength with a center wall thickness greater than the wall thickness of the service pipe on which they are used. Every Normac fitting is individually air tested.



COMPRESSION-END "ELLS"
Normac ells of all types incorporate every feature of the Normac coupling plus full coupling depth.

COMPRESSION-END SERVICE "TEE"
Full coupling depth. Special threads on male end prevent dropping into old hand taps.



NORMAC #50-A STEEL COUPLINGS
Manufactured from extra heavy wall pipe. Couplings are available with either seamless or welded centers in sizes from ¾" to 1½" inclusive. 10" and special length centers available.

Normac also manufactures a complete line of red brass fittings in O. D. sizes: ⅝", ⅞", 1⅛", 1⅜"—and a complete line of insulated couplings and fittings.

NORTON-McMURRAY MFG. CO.
919 North Michigan Avenue — Chicago 11, Illinois

Reach a new **HIGH** in unit heater sales!

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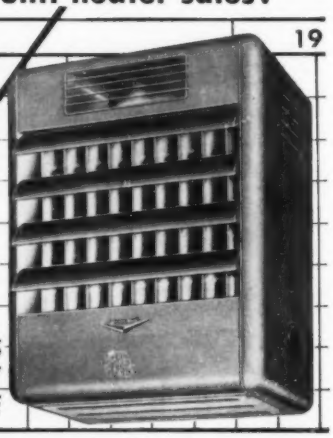
Peerless

GAS FIRED

UNIT HEATERS

THE HEATERS MOST FREQUENTLY ASKED FOR BY NAME



The best in Automatic low cost heating for stores—restaurants—factories—shops . . . in fact any commercial or industrial heating need.
Peerless Unit Heaters have genuine customer appeal in their beautiful neutral gray-green color . . . modernistic cabinet styling . . . compactness . . . economy and quiet operation.
Combustion chamber is made of ALUMINIZED steel that resists corrosion and greatly increases the life of the unit. A choice of fan or blower in all sizes from 50,000 B.T.U. to 200,000 B.T.U.
Peerless gives your customers materially more for their money as well as greater heating satisfaction and best of all, more profit and less headaches for you.
See your Distributor or write us for literature on these rugged and dependable Peerless Heaters that all smart dealers handle with pride.

PEERLESS MANUFACTURING DIVISION
OF DOVER CORPORATION—LOUISVILLE 1, KENTUCKY

for **leakproof, pressure-tight connections**

use **TiteSeal®**

SEALING COMPOUNDS

Heat and vibration-proof, non-solvent, will not shrink, crack or crumble. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion, joint seizure.

7 BASIC BLENDS

LIQUID WRENCH®

The super-penetrating rust solvent

LOOSENS

rusted bolts, nuts, screws, 'frozen' parts

Liquid Wrench works *fast*... yet is absolutely safe for all metals and alloys.

2171

At Industrial, Automotive, Hardware, Plumbing Jobbers

RADIATOR SPECIALTY CO.
Charlotte, North Carolina

SOLDER SEAL

ANCHOR'S BUTANE & PROPANE STAND-BY PLANT PACKAGE

ENGINEERING, INSTALLATION

Anchor's Engineering Dept. will design and supervise plant construction.

FINANCING

Anchor's experienced staff will assist with the financial details..

SUPPLIES

Huge tank car fleet, many plants and vast underground storage assure adequate supplies.

ANCHOR
PETROLEUM COMPANY
TULSA — CHerry 2-7261

GAS calendar

December

1- 6. . AGA-EEI Electronic Accounting Machine Development Seminar—Sheraton Cadillac Hotel, Detroit.

1- 6. . American Society of Mechanical Engineers Annual Meeting—Hotel Statler, New York.

2- 4. . Institute of Appliance Manufacturers — Shoreham Hotel, Washington, D. C.

2- 4. . Interstate Oil Compact Commission Annual Meeting—Tulsa

4. . NEGA Appliance Servicing Conference—Hotel Bancroft, Worcester, Mass.

19-22. . Pipeline Contractors Association Annual Meeting—Boca Raton, Fla.

1958

January

6- 8. . AGA Home Service Workshop—Hotel Radisson, Minneapolis.

10. . SGA Employee Relations Round-Table Conference — Edgewater Gulf Hotel, Edgewater Park, Miss.

17. . SGA Accident Prevention Round-Table Conference — Noel Hotel, Nashville.

17. . Oklahoma Utilities Association Accounting Section Meeting—Tulsa.

23. . NEGA Operating Division—Hotel Statler, Boston.

24. . SGA Pipeline Chief Engineers Round-Table Conference—Hilton Hotel, El Paso.

30. . New England Gas Association Accounting Division—Hotel Statler, Boston.

February

6- 7. . SGA Accounting Management Round-Table Conference—Monteleone Hotel, New Orleans.

6- 7. . SGA Sales Executives Round-Table Conference — Monteleone Hotel, New Orleans.

12-14. . Ninth Annual Tulsa Corrosion Short Course for Pipeliners (Tulsa Section, NACE)—Mayo Hotel, Tulsa.

20-21. . SGA Distribution Management Conference — Roosevelt Hotel, New Orleans.

20-21. . SGA Transmission Management Conference (Spring)—Roosevelt Hotel, New Orleans.

20-21. . SGA Distribution Management Roundtable Conference—Roosevelt Hotel, New Orleans.

GAS associations

Clifford V. Coons (left) took over as president of GAMA during the AGA convention. He succeeded Julius Klein (right). Mr. Coons is executive vice president of Rheem Manufacturing Co. and Mr. Klein heads Caloric Appliance Corp.

Coons, Rheem executive, heads GAMA

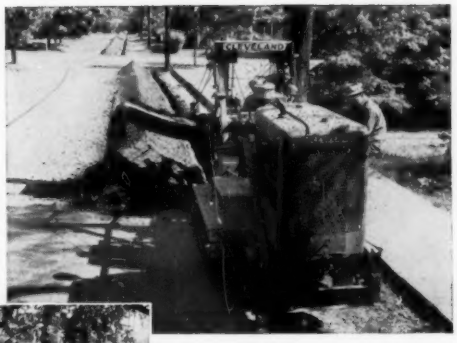
Clifford V. Coons, vice president of Rheem Manufacturing Co., New York, became president of the Gas Appliance Manufacturers Association during the AGA convention. He succeeded Julius Klein, president of Caloric Appliance Corp.

Other new officers are: 1st vice president, Edward A. Norman, Jr., president of Norman Products Co.; 2nd vice president, Wendell Davis, president of Cribben & Sexton Co.; treasurer (for a second time), Stanley H. Hobson, president of Geo. D. Roper Corp.

Combs retires as secretary of AGA section

Mahlon A. Combs, secretary of the AGA's industrial and commercial gas section for the past 11 years, has retired. He will continue to serve the association as a full-time consultant on utiliza-

DIGS STRAIGHT



DIGS CLOSE

DIGS FAST

Etowah Construction Company uses its Cleveland 95's compactness and shiftable conveyor to advantage on this utilities job in Franklin, Tennessee.

The Cleveland 95 "Baby Digger"—built by the Pioneers of the Modern Trencher, originators of *every* important trencher design feature—makes money for its owners because it . . .

- ***fits more jobs***--digs to 5½' deep x 24" wide.
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associations • *Continued*

tion bureau service manuals.

Mr. Combs has spent his entire business career in the gas industry. He joined the Consolidated Gas Co. of New York following graduation from the Stevens Institute of Technology. He joined the AGA in 1945 as assistant secretary of the industrial and commercial gas section and was named secretary six months later. During his 11 years as secretary, he initiated a number of successful projects, including the commercial and industrial gas schools, and organized the industry's Hall of Flame, of which he is a member.

Ralbern H. Murray succeeds Mr. Combs. He has been assistant secretary since last January. Before that he was an engineer with the utilization bureau for six years.

Ed Kern takes on new duties with GAMA

J. E. Kern, recently named director of manufacturer services of the Pacific Coast Gas Association, will also head western activities for the Gas Appliance Manufacturers Association.

Mr. Kern will serve as assistant to Harold B. Massey, secretary and managing director of GAMA, and will help coordinate the education and promotion program of western and eastern appliance manufacturers. His supervision will extend to association action from the Mexican to the Canadian borders and as far east as the Rocky mountains.

John Parrott heads Virginia utility group

John C. Parrott, president of the Roanoke (Va.) Gas Co., has been elected president of the Public Utilities Association of the Virginias. Mr. Parrott took office at the group's 39th annual meeting held in White Sulphur Springs, W. Va., recently.

Arthur T. Ellett, also of Roanoke, was reelected assistant treasurer of the association.

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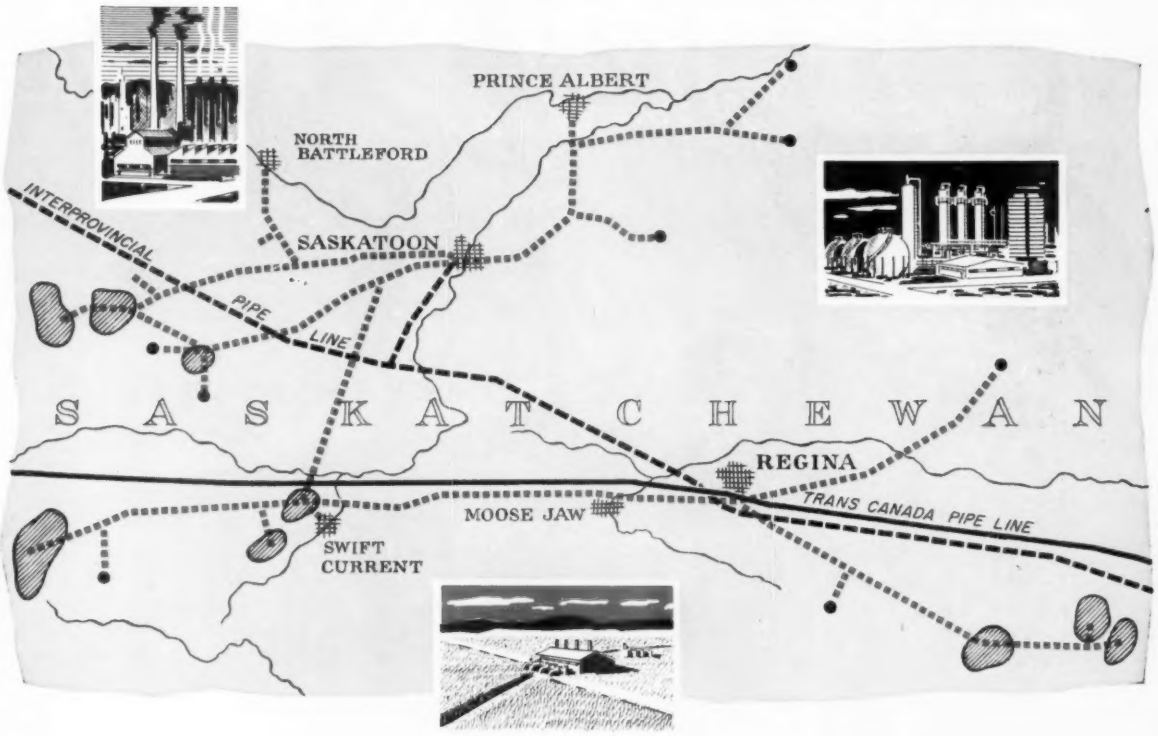

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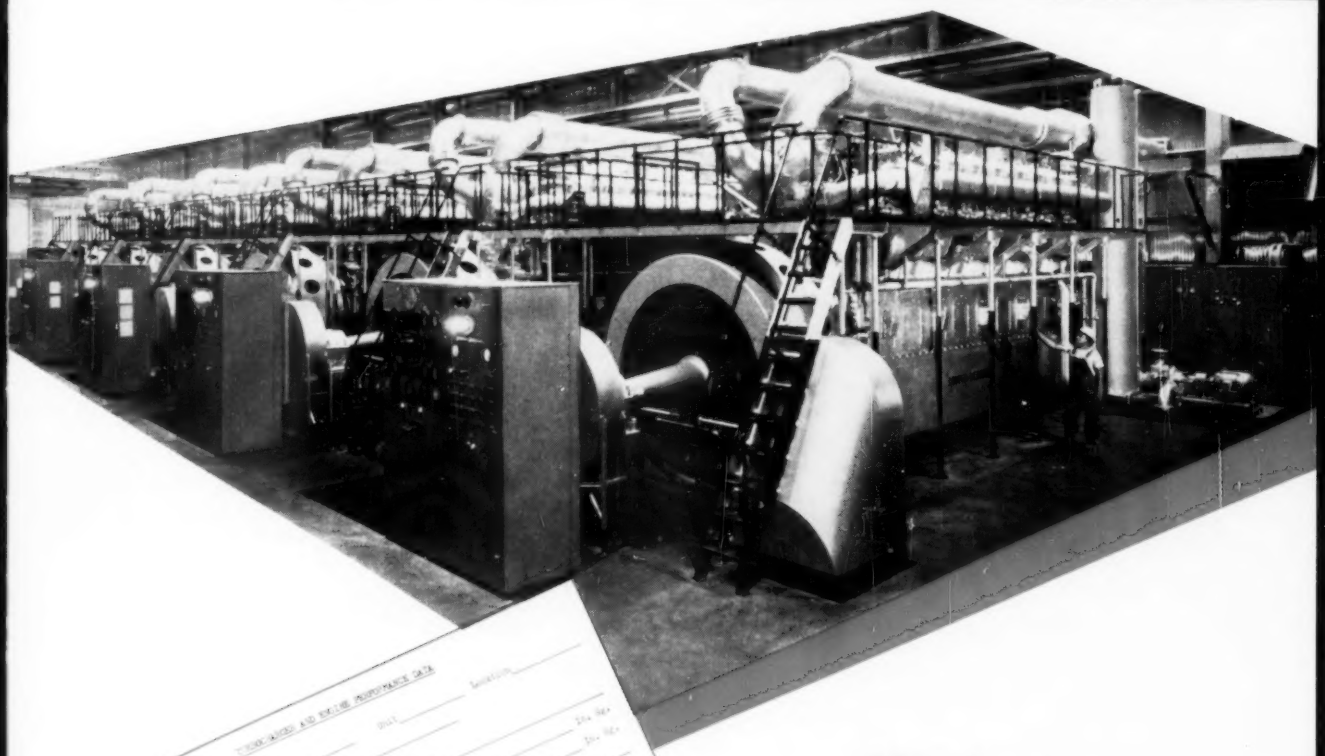
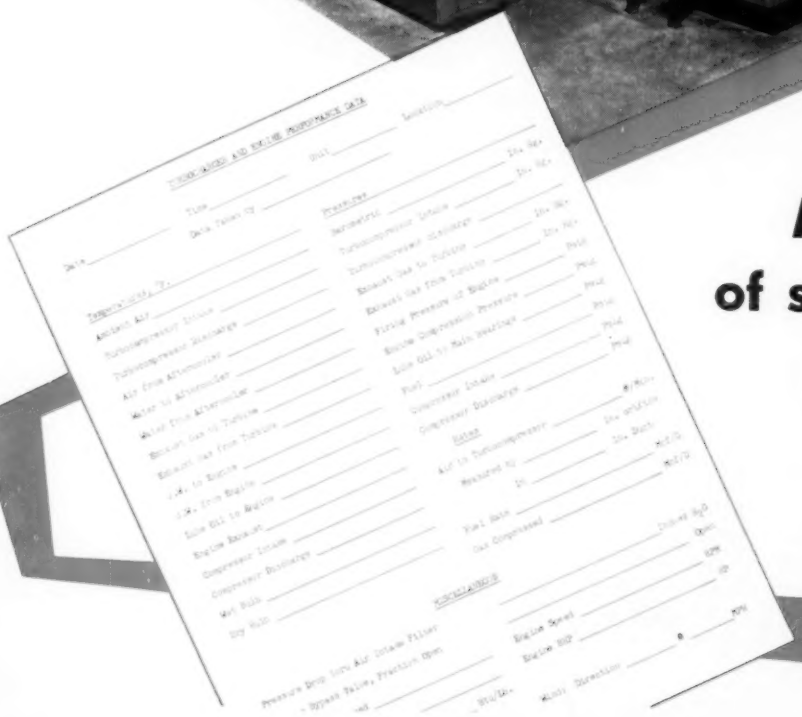
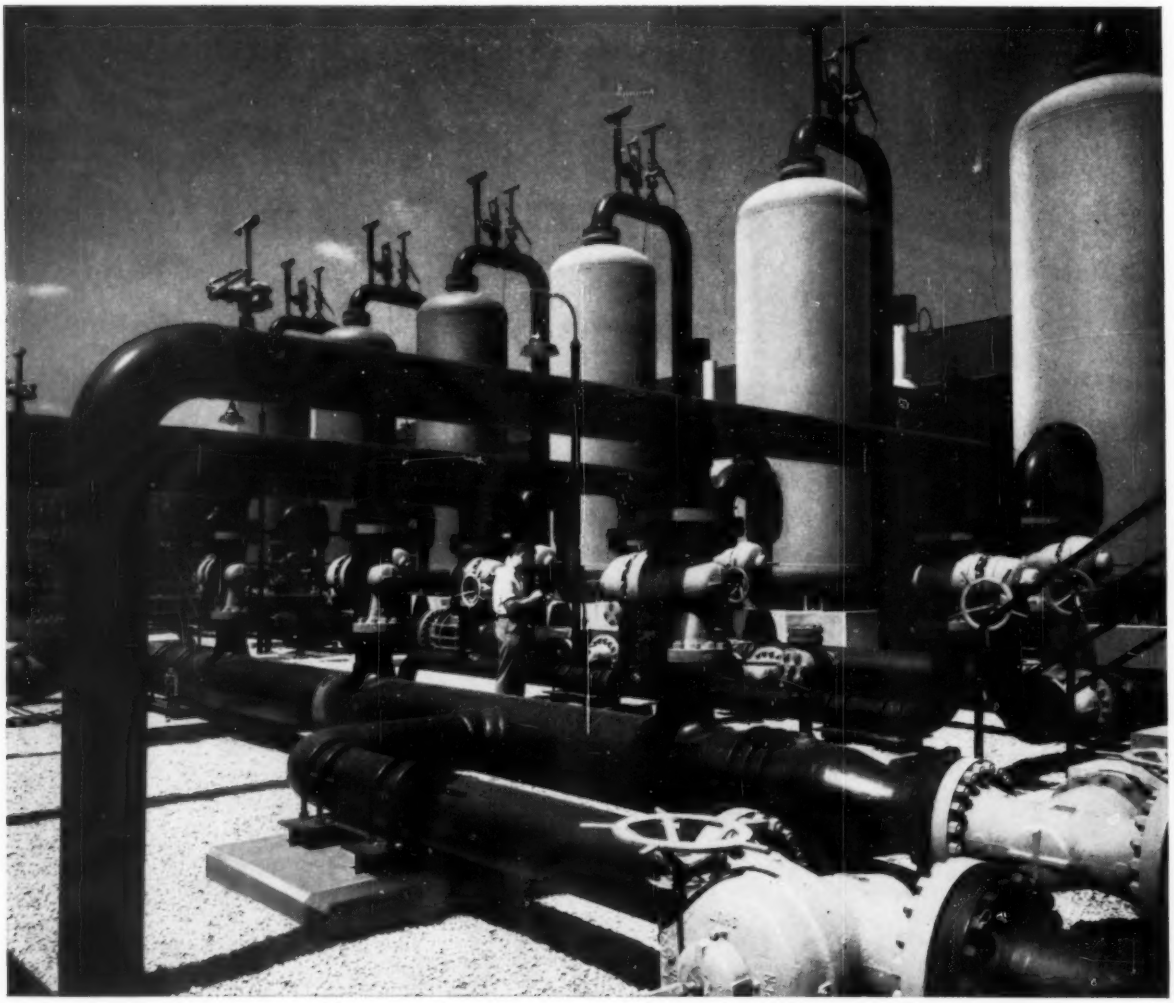




Maintenance of supercharged gas engines



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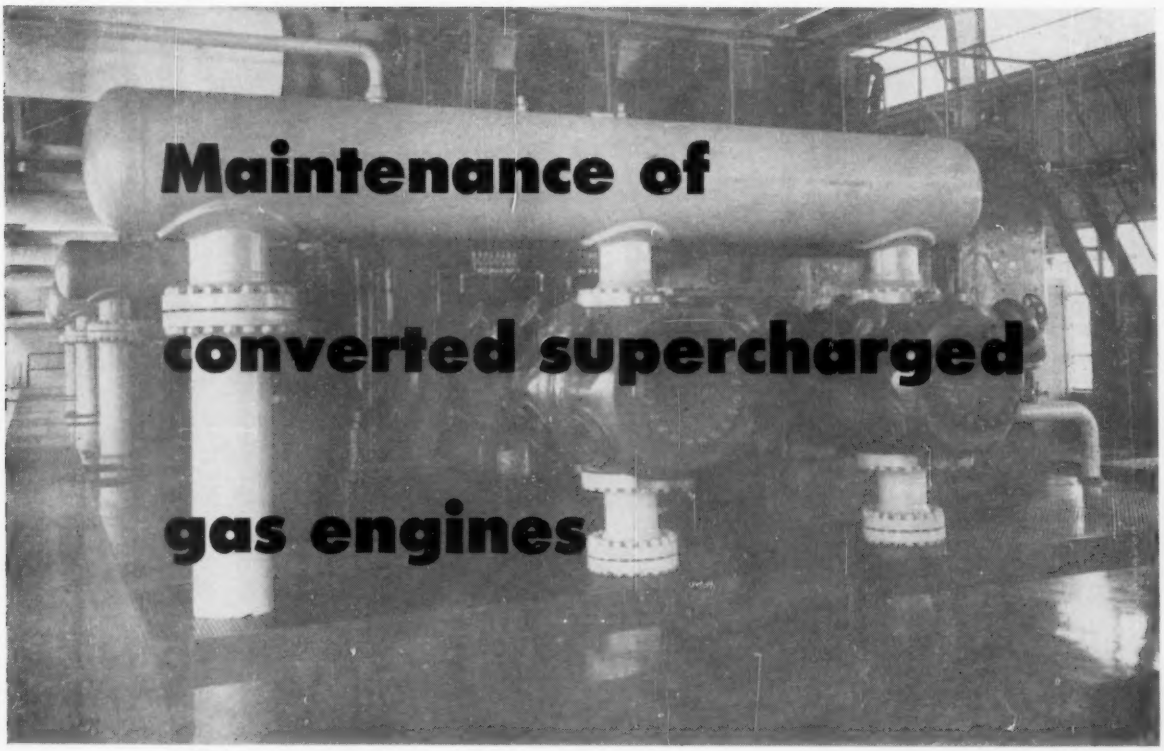


Maintenance of converted supercharged gas engines

By CLARENCE E. GOTTERBA
Richfield Oil Corp., Bakersfield, Calif.

THE natural gas and natural gasoline industry in California has just started to equip its existing engines with turbocharger kits. At the present time, there are seven converted turbocharged units in the state, with several additional conversions under construction or in the planning stage. It should be stated now, however, that there are several other installations in California where turbocharged engines are in operation. Worthington has one installation of 10 1750-hp engines with Elliott turbochargers, Ingersoll-Rand has installed eight 2000-hp units, and Cooper-Bessemer has installed one 3500-hp unit. Richfield has one 2000-hp turbocharged Clark TLA. All of these units are developed for turbocharging at the factory. This article will be concerned with the maintenance of converted turbocharged units only.

As far as I know, the first use of turbocharger kits in the utility and petroleum industry in California was by the Pacific Gas & Electric Co. at Kettleman Hills where four Clark HBA-8's with rated horsepower of 1760 have been converted with a corresponding rise of about 20 per cent in horsepower. Conversion was made by a standard unit provided by Clark for this specific job. These units have been in operation for about a year. It is my understanding that PG&E is planning to make additional conversions at Kettleman Hills in the near future. PG&E also has started the conversion of eight Cooper-Bessemer GMW's to turbocharged

units at the Topock compressor station, near Needles, Calif. Through the use of standard Cooper-Bessemer conversion kits, using series turbocharging, they are increasing the delivered horsepower of the units from 2500 to 3500. One conversion is complete, and the second conversion is almost complete.

Richfield has converted two different type Clark compressors to turbocharging. Our first unit was designed and installed by engineers from Richfield and the AiResearch Industrial Division of the Garrett Corp. on a Clark MA-8, a two-cycle, right angle, gas engine-driven compressor. This compressor was rated at 300 hp at 600 rpm at sea level, and operated at reduced horsepower due to the elevation of the unit. The turbocharger unit consists of two AiResearch turbochargers mounted on a fabricated dry exhaust manifold with ducting connecting the turbochargers in series to the existing four scavenging pumps. The intercooler is located between the turbochargers and the scavenging pumps. The unit is now being operated with one scavenging pump inactivated. The turbocharged compressor is now loaded to 355 hp at 1810-ft elevation, or an increase of approximately 30 per cent.

We have recently installed a packaged turbocharger unit on a Clark HBA-6, a two-cycle, right angle, gas engine-driven compressor. This compressor had a rated horsepower of 1320 at 300 rpm at sea level. The unit consists of a single turbocharger mounted at the end of a fabricated dry exhaust manifold. The existing scavenging cylinders have been completely inactivated except for use as a counterbalance with all the valves removed. The intercooler is located on the discharge of the turbocompressor. Here we experienced a horsepower increase of about 23 per cent obtaining 1620 hp from the turbocharged unit.

Preventive maintenance and repairs of gas engines and compressors is a subject that has been very thoroughly covered by each equipment manufacturer in the operating manuals usually supplied with each piece of equipment.

Maintenance of converted supercharged gas engines can be divided into two parts: first, the maintenance of the turbocharger and component parts itself, and second, the changes in normal maintenance of the compressor brought about by the installation of the turbocharger. We will be concerned with both types of maintenance here, discussing them in the order just mentioned.

Equipment added to an existing compressor in turbocharging can be divided into separate groups: the turbocharger itself, the aftercooler or intercooler, additional larger capacity air intake filters, a new muffler, and of course, the ducting to connect these parts. As a basis for future diagnosis of trouble, a test of the converted unit should be made soon after start-up. Measurements of air and water flow, pressures, and temperatures, etc., should be taken and recorded. On the HBA-T6, a calibrated orifice was installed in the air intake duct to measure air flow. AiResearch supplied a calibrated bell-shaped flow nozzle for air measurements for the MA-8.

The turbocharger bearings should be checked visually for wear every 5000 to 10,000 hours at first. It may be possible to lengthen the time between inspection periods after the unit has been in operation for some time. It is practically impossible to cite clearances for turbocharger bearings; some are aluminum, others are babbitt encased in steel, etc. The manufacturer of each turbocharger kit will supply clearance data, both new and worn, and data on required rotor end play, etc.

Manufacturers state that, except under severe operating conditions, it should not be necessary to clean either the turbine or compressor wheel more than once each 10,000 hours. Deposits on either wheel can impair efficiency and disturb the fine balance of the rotating assembly. On the basis of surface indications, vibration and rpm, and comparison of air pressures and flows delivered by the turbocharger with the original flow rates and pressures, one can determine if the turbocharger air capacity is being impaired by dirt on the compressor wheel or combustion deposits on the turbine wheel. This is assuming, of course, that no great change in operating conditions occur.

When it is decided that a cleaning of the rotating assembly is necessary, care should be taken to do a thorough job. An incomplete cleaning job can cause a wheel to be more out of balance than if it were left untouched. It is never advisable to scrape or chip deposits from turbocharger wheels. A good industrial cleaner should be used. Any marks or scratches on turbine or compressor wheels should be carefully smoothed, and the wheel rebalanced. The wheels should be checked for cracking by tapping upon them. A solid blade will give a solid ring, a cracked blade will sound dull. At this same time, all the seals in the turbocharger should be inspected. When installing seals, great care should be taken to insure that the seals are clean so they will function properly.

The force feed for the turbocharger lubrication system is taken directly from the engine oil system on our installations, but a separate oil system could be installed. Lubrication of the turbocharger bearings is critical, and manufacturers' recommendations as to flow rates and temperatures should be strictly adhered to. An oil with a viscosity in the SAE 20 to 50 range is recommended. We have found it advisable to provide a full flow filter of sufficient capacity and high efficiency. A sight flow indicator is recommended on the oil return to the oil sump or crankcase of the engine. The oil carries with it the air leaking through the labyrinth type air seal on the shafts, and visual inspection of uninterrupted flow is possible. Force feed hand pumps to flush the turbocharger bearings before start-up should be provided. Some manufacturers do not require this, but they specify that the bearings must be receiving full oil flow within 15 seconds after start-up. Because of the high speed of the turbocharger, it is important to have the proper amount of oil flowing to it at all times during start-up.

When the turbocharger is inspected, it is also well to inspect the safety devices used for controlling turbine overspeed. To date we have not experienced any mishaps with our turbochargers, but we are aware of the possibility of the turbocharger running away.

One operator I know of has experienced this condition and had extensive damage to turbine and compressor wheels.

There are several possible sets of conditions that could cause a turbine to run away. One condition could be caused by having the spark retarded too much. It is also possible for the engine to die during operation, and stop in such a position that would allow a fuel injection valve to remain open. If a fuel injection valve is open and both ports are left uncovered, the possibility exists of gas being burnt in the exhaust manifold, thus supplying energy to drive the turbine. The turbine in turn would supply more air for combustion, and this leads to a spiraling circle of events resulting in the turbine wheel actually running away with itself. This results in possible damage to both wheels and bearings, and also the wheel housing. To preclude the possibility of such a sequence of events happening, a diaphragm-operated, spring-loaded valve is located on the fuel line to the compressor. This valve is set to shut off the fuel when the oil pressure drops because of the engine dying, or when the scavenging air pressure increases from turbine overspeed. No additional safety devices are required for a turbocharged engine than those required by a regular unit.

During the original testing of the turbocharged unit, the heat transfer rate in the intercooler or aftercooler is measured, and used as a basis for inspecting these coolers. Whenever excessive fouling occurs, the exchanger should be cleaned. This check on the efficiency of the coolers should be made at least every 10,000 hours. At the same time, a hydrostatic test for leaks should be made on the cooler, if it is water cooled. These coolers are usually made of aluminum, brass, or copper.

Of course, the best way of insuring against any trouble from this exchanger is by having a good water treatment. There are many such treatments available on the market at the present time, from chemicals to soluble oils. Some turbochargers, such as those manufactured by Cooper-Bessemer and Elliott, have cooling water circulated through the jackets of the two casings surrounding the turbine. Clark Bros. and AiResearch units are operated dry. Here again, the water must be clear and soft to avoid scaling of the passages. It is recommended that the cooling water temperature rise should be kept between 20-25° F.

No regular inspection period can be recommended for the air filters. This depends entirely upon existing conditions at the operating location. A dusty or foggy atmosphere, of course, means more frequent cleaning of the filters. It is essential that there be no more than 2 in. of water pressure drop through the filters. A larger drop begins to restrict the flow of air to the compressor, and will cut down the effectiveness of turbocharging. Trouble may be experienced during freezing weather when the water content of the air is high due to ice forming in the filtering element and restricting air flow.

There is little maintenance that needs to be done to the air ducting if it is properly designed and installed. The ducting should be large enough so as not to restrict flow and so as to have a minimum pressure drop through it. Otherwise, the power cylinders might receive an insufficient amount of air. Whenever the turbocharger is shut down for inspection, it may be well to inspect the ducting and clean it if it is dirty from oil being pulled over from a partially frozen filter element, etc. Stainless steel screens are placed in the line connecting the exhaust manifold to the turbine inlet, and it is advisable to clean and inspect these screens at this time. These screens are to protect the turbine blades against the possible failure of some part in the combustion chamber, such as a fuel injection valve, broken piston rings, or an air starting check valve. If these parts should enter the turbine, they would seriously damage the wheel. The possibility of such an occurrence suggests the practice of magnafluxing all parts before installation on the compressor as an added precaution.

With the installation of turbochargers, our spare parts inventory has increased only slightly in number but greatly in cost. For our HBA-T6 we have in stock a complete turbocharger rotating assembly, including bearings and seals. Our operations require an absolute minimum of downtime, and the savings in downtime that such spare parts affords more than pays for the cost of the inventory.

Having had our units in operation for only about six months, we have not yet been able to fully evaluate the effect of these turbochargers on the maintenance of the compressors themselves. From preliminary indications, such as lube oil conditions, port conditions, and ring conditions, we feel that it may be possible to extend the engine overhaul period from one year to somewhere between 16 and 24 months. We also expect to perform less maintenance on the scavenging cylinders themselves because they are at the present time doing less work than before, or being used as crankshaft counterbalances.

There are other aspects of the maintenance program, however, that require more frequent attention because of the turbochargers on these units. We have found that the importance of keeping the load balanced among high compression power cylinders is emphasized due to the greater load imposed on the engine and the consequent higher firing pressures on the power cylinders. It is recommended that the balancing procedure be followed at least every 30 days to begin with. We have had good results by using a pressure indicator and taking ordinary pull-cards. Although this is not the best method of balancing engines, it is fairly quick and easy and has proved satisfactory in most cases.

In an attempt to obtain a more trouble-free ignition system on our turbocharged engines, we have installed new Bendix low tension, Type LAR, high output magnetos. These magnetos have, except for some minor breaker point trouble, operated satisfactorily. Most companies use modified dual ignition; two high tension coils in series with one magneto. We have found that turbocharging our compressors cuts the life of spark plugs approximately in half because of the higher pressures involved. Of course, when one plug fails, we replace them all, as before. In our HBA-T6 we have changed spark plugs to B.G. RB-

TABLE 1. Performance Data on Turbocharging Clark MA-8 Compressor

	BEFORE	AFTER
H.P.	300	355
R.P.M.	600	600
BMEP	59.6 P.S.I.	73.0 P.S.I.
Gas volume handled		
1st Stage	928 Mscf/d	1129 Mscf/d
2nd Stage	944 Mscf/d	2644 Mscf/d
3rd Stage	1406 Mscf/d	1031 Mscf/d
	At sea level	At 1810 Feet

842S, and have extended plug life considerably. We still haven't attained plug life on this unit as long as on non-turbocharged units, but we have hopes of getting such plug life through more experimentation and development.

In turbocharging our MA-8, because of the higher BMEP (73 psi after turbocharging as compared with below 60.0 psi before) and consequently higher loads on this turbocharged engine, we are installing aluminum main and connecting rod bearings. It has been demonstrated that aluminum has over 50 per cent greater load carrying ability than babbitt, and Cooper-Bessemer's aluminum bearings have given up to 3½ times the life. Accompanying this advantage of greater load capacity of aluminum is the disadvantage of providing a larger capacity oil pump to compensate for the increased clearances necessary with the aluminum bearing, although Cooper-Bessemer uses the same clearances, and the necessity of greater flushing and cooling action of the oil. In addition, a much finer lube oil filter is required. We feel that it is necessary to remove particles down to 30 micron size. This is because aluminum is harder than babbitt, and it is difficult for small, hard particles to become imbedded in the aluminum as they do in babbitt. Such particles tend to score the shaft.

All indications thus far show no ring problems. In the MA-8, engineered piston ring sets were used. On the HBA-T6, the rings that were original equipment were used. Both types of rings are operating satisfactorily.

Before summarizing, it might be well to bring out several points regarding turbocharging that we feel are very important. Before attempting to turbocharge any existing compressor, it is always wise to consult the manufacturer to determine the safe load that the compressor and engine itself could be subjected to. This includes the frame, bearings, crankshaft, power cylinders, oil pump, air filter, muffler, etc. When exceeding design load by as little as 25 per cent, the manufacturer may recommend chrome plated power cylinders, or other various changes. Naturally, exceeding the engine's capabilities will greatly increase maintenance costs, whether turbocharged or non-turbocharged. It is theoretically possible to size the turbochargers so as almost to double the horsepower of the original engine. However, it is quite probable that doing this would result in quite rapid engine failure.

The precautions that should be taken with the start up of any two-cycle engines should be followed more closely with those engines having turbochargers. If at first the engine fails to fire, the fuel gas should be shut off completely and the entire system purged of any gas before attempting to start again. Failure to do so may result in explosions in the exhaust manifold or turbine itself.

Turbochargers are precision pieces of equipment and are not mass produced as in other industries. AiResearch in Los Angeles comes close to it on its conveyor system of sub-assembly. The rotating assembly is balanced for higher rotating speeds than would be experienced on an engine and, therefore, every precaution should be used when inspecting, dismantling or assembling so as not to damage any parts. It should always be remembered that the rotating assemblies operate at 7500 to 30,000 rpm and temperatures of 800°-1000° F.

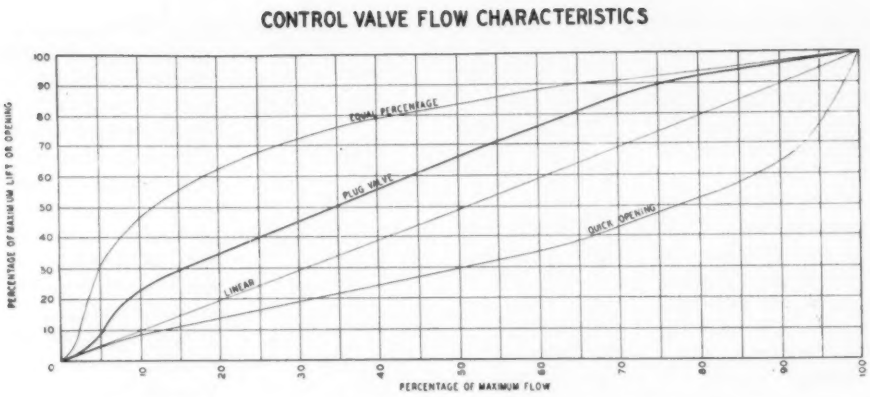
Our normal water-cooled exhaust manifolds have been replaced with dry manifolds on air turbocharged units. These are installed with built-in expansion joints, and insulated for the high operating temperatures. The bellows type expansion joint was installed to relieve any strain set up in the piping from exhaust heat. We have taken every precaution to insure that all the ducting and oil piping is absolutely clean. The ducting was polished to remove mill scale and slag from welding and at one installation we galvanized the piping after fabrication, inside and out, to further insure against any metal particles entering the engine.

Tables 1 and 2 depict the operating characteristics of our two turbocharged units before and after turbocharging. The increase in delivered power from turbocharging the first installations was made at a cost of $180 per horsepower, completely installed. Although the cost of maintenance has not been completely determined, we feel that the total cost of maintaining each compressor has increased about 10 per cent, but the maintenance cost per delivered horsepower is less. ■

TABLE 2. Performance Data on Turbocharging Clark HBA-T6 Compressor

	BEFORE	AFTER
H.P.	1320	1630
R.P.M.	300	300
BMEP	75.3 psi	93.0 psi
Gas volume handled	24,345 Mscf/d	29,040 Mscf/d
Compressor cylinders	4-4 1/8" x 17"	4-4 3/8"x17"
	One S.A., H.E.	All D.A.

This article has been adapted from a paper presented by the author at the fall meeting of the California Natural Gasoline Association, Oct. 10-11, at Pasadena, Calif. The author is superintendent of Richfield's natural gasoline department at Bakersfield, Calif.



Comparison of flow characteristics of various control valves and plug valves (Fig. 2).

Use of a plug valve as a control valve

By **JAMES H. STANNARD JR.**
Pacific Gas & Electric Co., San Francisco

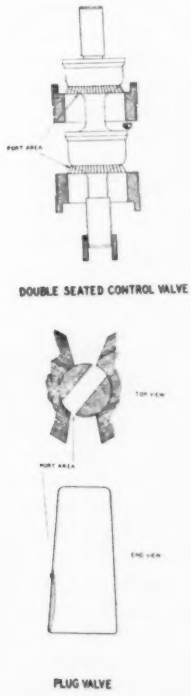


Fig. 1. Comparison of port openings of conventional control valves and plug valves at small openings.

GAS engineers have used plug valves in throttling service for many years. These valves are positioned either manually or automatically. Much experience has been gained from the standpoint of both wear and service. Many engineers have used a rule-of-thumb approach to the application of a plug valve as a control valve.

When a pipeline design problem is being considered, the optimum design calls for the expenditure of the least amount of money to perform a given task. Most pipelines terminate in regulating or control stations, and the performance of these stations must also be considered in the over-all design of the pipeline. An example of the effect of the terminal station design can be shown in the following hypothetical pipeline problem:

This particular pipeline is to serve a metropolitan area feeder system 100 miles from the source. The terrain is level. The available pressure at the source is 800 psig, and the required pressure at the terminal end is 350 psig after regulation. The peak hour load will be 7.0 M^2scf/hr and the minimum hour load on the minimum day will be only .250 M^2scf/hr.

If 20 psi is allowed for pressure drop across the control valve at peak flow, an analysis[1] of the problem indicates that 22.8 miles of the pipeline should be 22-in. pipe and the balance of 20-in. pipe. However, if the pressure drop for regulation is cut in half only 19 miles of 22-in. pipe will be required. This minor reduction in pipe requirements will save approximately $25,800. It should be quite obvious that much money may be saved through judicious selection of control valves.

Control valve sizing

Most control valve manufacturers now follow the practice of quoting a *flow coefficient* for each size and style control valve. The generally accepted definition of the term ". . . *flow coefficient* indicated as C_v is the number of U. S. gallons of water per minute, at 60°F, that will flow through a valve at maximum opening and a pressure drop of 1.0 psi measured in the inlet and outlet pipes directly adjacent to the valve body."[2]

The flow coefficient is a very convenient method of expressing the capacity of a particular valve with-

This article is adapted from a talk presented at the joint AGA-PCGA transmission conference held in San Francisco, May 8-10, 1957.

out specifying the fluid, flowing condition, or pressure drop across the valve. The actual capacity of a control valve is dependent upon all of these factors, and a capacity table for a particular valve would have to take all of them into account. On the other hand, the flow coefficient expresses the capacity or restriction of a particular valve with a reasonable degree of accuracy for all mediums or flow conditions. There are a number of mathematical relationships which express valve capacity in terms of flow coefficient for gases, liquids and saturated vapors.[3]

The usual procedure in sizing a control valve is to determine the required flow coefficient at maximum flow conditions, and then to pick a control valve of adequate size and characteristics. However, a complete analysis of the control valve size required that some consideration be given to minimum flow capacity. If a control valve is too large for the flow that is to be controlled, the valve may "hunt" or even lose control.

Rangeability

Rangeability is defined as "... the ratio of maximum to minimum flow within which flow characteristics are maintained within stated limits."[4] Many control valve problems in the gas industry are complicated by the fact that the maximum pressure drop is available at minimum flow and the minimum pressure drop is present during periods of maximum flow. The definition of rangeability given here presupposes a constant pressure drop between maximum and minimum flows. To interpret rangeability correctly the capacity of the valve at maximum pressure drop (such as would occur during minimum flow) should be compared to minimum flow requirements.

Most control valve manufacturers rate the rangeability of their standard control valves as 50 to 1. If a particular control valve is tight closing its rangeability is theoretically infinite. However, even the best control valves do not maintain their flow characteristics at very small openings—thereby limiting their rangeability. Some control valves are capable of performing with much wider rangeabilities than 50 to 1, but other problems such as noise and wear often become a serious problem when a valve is required to operate in such extreme service.

When discussing rangeability requirements, it is often convenient to convert all flow requirements to flow coefficients. Thus, in the hypothetical pipeline, the maximum required flow coefficient will equal 1496 when only a 10-psi drop is allowed for regulation and the minimum required flow coefficient will be 7.9 with a pressure drop of 448 psi.[5] The ratio of these flow coefficients or the required rangeability is 190 to 1.

One approach that is frequently used in extreme rangeability problems is to install two control valves in parallel. The two valves are then operated with a split range: one control valve leads the other and is completely open before the second valve starts opening. If this approach is used to solve the requirements of the hypothetical pipeline, the leading control valve should have a flow coefficient equal to or less than 395.[6] One manufacturer rates his 6-in. double-seated control valve as having a flow coefficient of 360, which would satisfy the above requirement. This, however, presupposes that the other valve is tight closing.

Leakage

The *leakage* of a valve is the flow in percentage of rated capacity when the valve is normally seated. Again it is often more convenient to discuss leakage in terms of flow coefficient. An often quoted value for leakage of a standard double seated control valve is one half of 1 per cent; i.e., the *equivalent flow coefficient* for the leakage of a valve in the closed position would be one half of 1 per cent of the *rated flow coefficient* of the valve in question. It should be pointed out that it is virtually impossible to guarantee tight closing of a double-seated control valve with metal to metal seats because of the unequal thermal expansion between the body and the valve spool as well as body distortion under pressure.[7]

If a 6-in. control valve is used for a leading control valve as determined above, the flow coefficient of the second control valve will have to be in excess of 1136.[8] The nearest size quoted by the same manufacturer is a 12-in. double-seated control valve with a V-port plug, which has a flow coefficient of 1400. The equivalent flow coefficient for the leakage of this valve would be 7. If this leakage is added to the minimum controllable flow of the leading control valve $7 + 360/50 = 14.2$, which is more than the minimum required flow coefficient, it becomes apparent that the use of parallel conventional control valves will not satisfy the requirements of this problem.

The plug valve as a control valve

If a valve capable of tight closing is used for the second control valve, the parallel control valve arrangement is still feasible. Among the conventional control valves there are several types that are capable of tight closing. These include single-seated control valves that have been properly seated, expansible sleeve valves, and soft-seated valves of both the double- and single-seated types. Unless the single-seated control valve is equipped with a force balancing arrangement and a piston type operator, its use should be limited to relatively low pressure drops and small sizes. The expansible sleeve valve is not a conventional control valve, but it is now being offered as a control valve and it does offer many advantages as a tight closing valve. However, its service is generally limited to those conditions that will assure a pressure drop equal to or greater than the sleeve expanding pressure. The soft seated control valves are generally limited to relatively low pressure drops because of the potential failure of the soft seats.

The plug valve has been used extensively as a control valve in recent years. Its reputation as a tight closing valve is well known to the gas industry which has used it as a shutoff valve for many years, but its behavior as a throttling device has rarely been discussed. Probably the most damning statement to be made against the plug valve employed as a control valve is that it was not designed for that service. However, when properly applied to that service it performs admirably.

When used in the service mentioned above; i.e., as a second or lagging control valve in a parallel control valve arrangement, a properly sized plug valve has a number of desirable characteristics. Not only does the plug valve offer tight closure, but it also performs much better than most conventional control valves in the transfer of control from the leading to the lagging control valve and back again.

When a conventional double-seated control valve opens, the initial opening is a thin slot around the periphery of both valves. On the other hand, when a plug valve starts to open, only a very short triangular shaped opening is exposed. Upon initial opening the effective port area of the plug valve is reduced by the fact that the throttling takes place in two orifices in series. The net result is that the rangeability of the plug valve is considerably better than the conventional control valve. The finer control on initial opening facilitates a "bumpless" transfer of control from the leading to lagging control valve.

The plug valve has also been used with varying degrees of success as an independent control valve. It has been shown that the rangeability of the plug valve is considerably better than that of the conventional control valve; however, the flow pattern of the plug valve on initial opening is far from ideal. The two orifices in series are too close for complete flow stream recovery and they may cause such undesirable side effects as noise and severe pulsations. The use of a plug valve as an independent control valve should be made only after some consideration of the possibility of these undesirable side effects.

Plug valve flow characteristics

In the language of the process engineer, there are three basic flow characteristics of control valves: equal percentage, linear, and quick opening. Upon initial opening, the plug valve has a flow characteristic similar to the equal percentage valve and then becomes linear. While this is not an ideal characteristic, it is generally good enough for most control problems in the gas industry.

Mechanical characteristics

The proper operation of a plug valve demands an extremely rigid body that will not be distorted under internal pressure or external strain. Because the body of a plug valve is thick compared to the conventional control valve, the margin for wear is larger and the functions of the valve are less affected by throttling abrasion.

The conventional control valve is usually positioned with a spring and diaphragm pneumatic operator, which coupled with the valve stem and valve spool forms a spring-mass system. This spring-mass system can be set into vibration under the influence of any turbulence in the valve. On the other hand, most plug valve operating mechanisms employ either a rotary geared drive, a hydraulic pistol, or a combination of both. The lack of a spring in the plug valve control valve does much to eliminate mechanical vibration of the control valve assembly. This reduction of mechanical vibration permits much better control of minimum flows.

In those services that require only a very rough control, the simplest design of operator actuation may be tolerated. However, in those services requiring very fine control or wide rangeability a mechanical feed-back in the form of a valve-positioner should be specified. The valve-positioner permits a high degree of accuracy in positioning the plug and lends a reproducibility to the control circuit.

Precautions

Probably the most common cause for disappointment in the use of a plug valve for throttling service is the over-sized valve. It is only natural to think of using a valve as large as the line, particularly in those applications that involve a conventional control valve in parallel and leading. It should be remembered that even a plug valve has a rangeability limitation and just as much care should be given to the selection of a plug valve for throttling service as would be given to a conventional control valve. Most plug valve manufacturers publish pressure drop data for their various valves,[9] and from these data it is easy to determine a flow coefficient for the various valves under consideration. In those applications involving the use of an independent control valve, the designer would do well to limit the rangeability requirements to 50 to 1, thereby reducing the problems of noise and localized erosion. In those services which call for parallel control valves, the conservative engineer will not count on much over 100 to 1 rangeability from the plug valve, and then he will determine the magnitude of the transfer "bump" that will be experienced.

Another major cause of trouble when the plug valve is used as a control valve is lack of preventive maintenance. A plug valve should be lubricated regularly and the operator should be inspected and lubricated frequently. It should be remembered that those operators deriving their power from the line gas will use a very dry gas that offers no lubrication and quite frequently carries much fine and abrasive dust.

Operating experiences

In 1937 the Pacific Gas & Electric Co. installed a plug valve in its Westlake control station which was equipped with an electric operator. This valve was to be operated manually, but remotely, and it remained in that service—throttling continually—until 1948. At that time it was replaced with a valve of a higher working pressure. When the original valve was examined for wear it was found to be "as new" and was returned to service in another location. Both valves are still in active service.

In 1939, PG&E installed two plug valves in its Napa Wye station. These valves were equipped with piston type air motors and very crude geared drives. The air motors were automatically activated by conventional pneumatic controllers. One of these valves was removed in 1952 to accommodate a rearrangement of the station piping and the remaining valve is due to be replaced this year. The one removed in 1952 was still in good condition. However, the one to be replaced this year is badly worn but still serviceable. Both of these valves were cast-iron and probably suffered a lack of lubrica-

tion from time to time. Nevertheless, both functioned well under very severe service for more than 12 years.

Following many years of satisfactory performance by these and other plug valves in similar service, PG&E installed a number of 24-in. plug valves as throttling control valves on its 34-in. Topock-

Continued on page 124

APPENDIX I

Calculation of Line Sizing

Given: A 100-mile gas pipeline operating from a head pressure of 800 psig to a terminal pressure of 360 psig and 370 psig. This line is to be capable of meeting a demand of 125 M²scf/day of a .6 gravity natural gas with a peak hour flow of 7 M²scf/hr. The minimum flow anticipated in the pipeline is .25 M²scf/hr.

Flow Formula:

$$Q = 181.6 \sqrt{\frac{D^5 (P_1^2 - P_2^2)\, Y}{SfL}}$$

Where

- Q = flow rate, cubic feet per hour, at 60°F. and 30″ Hg.
- D = inside diameter of pipe, inches
- P_1 = head pressure, psia
- P_2 = terminal pressure, psia
- p_1 = head pressure, psig
- p_2 = terminal pressure, psig
- Y = superexpansibility factor
- S = specific gravity of gas at 60°F. and 30″ Hg. (Air = 1)
- f = pipeline friction factor
- L = length of pipe, feet

Note: The calculations that follow were made using the Polyflo flow computer which is based on the above equation.

(a) Peak Hour Pipeline Design with p_2 = 360 psig

Allowable $P_1^2 - P_2^2$ from 800 psig to 360 psig = 525,000

From Polyflo computer:

$P_1^2 - P_2^2$/mile of 19.375″ ID (20″ OD) = 5690

$P_1^2 - P_2^2$/mile of 21.375″ ID (22″ OD) = 3370

Let x = miles of 20″ and 100 − x = miles of 22″

$P_1^2 - P_2^2$ (Over-all) = $P_1^2 - P_2^2$ (in 20″) + $P_1^2 - P_2^2$ (in 22″)

$525{,}000 = 5690x + 3370\,(100 - x)$

$x = 81.0$ miles of 20″ pipe

$100 - x = 19.0$ miles of 22″ pipe

From Polyflo computer:

with p_1 = 800 psig and Q = 7,000,000 scf/hr. p_2 = 360 psig

or Q = 250,000 scf/hr. p_2 = 798 psig

(b) Peak Hour Pipeline Design with p_2 = 370 psig

Allowable $P_1^2 - P_2^2$ from 800 psig to 370 psig = 516,000

From Polyflo computer:

$P_1^2 - P_2^2$/mile of 19.375″ ID (20″ OD) = 5690

$P_1^2 - P_2^2$/mile of 21.375″ ID (22″ OD) = 3370

Let x = miles of 20″ and 100 − x = miles of 22″

$P_1^2 - P_2^2$ (Over-all) = $P_1^2 - P_2^2$ (in 20″) + $P_1^2 - P_2^2$ (in 22″)

$516{,}000 = 5690x + 3370\,(100 - x)$

$x = 77.2$ miles of 20″ pipe

$100 - x = 22.8$ miles of 22″ pipe

From Polyflo computer:

with p_1 = 800 psig and Q = 7,000,000 scf/hr. p_2 = 370 psig

or Q = 250,000 scf/hr. p_2 = 798 psig

Requires 22.8 miles of 22″ installed instead of 19 miles, an increase of 3.8 miles.

3.8 miles △ 22″ − 20″ @ 16¢/lb. $25,800

APPENDIX II

Flow Coefficient Formulas:

For gases:

$$Q = \frac{1360\, C_v \sqrt{(P_1 - P_2)\, P_2}}{\sqrt{GT}}$$

When $P_2 < \frac{P_1}{2}$

$$Q = \frac{680\, C_v\, P_1}{\sqrt{GT}}$$

- Q = scf/hr. @ 14.7 psia and 60°F.
- P_1 = inlet pressure psia
- P_2 = outlet pressure psia
- T = flowing temp − °F. abs.
- G = specific gravity of gas

Calculations for hypothetical pipeline

Maximum required C_v

$$C_v = \frac{Q\sqrt{GT}}{1360\sqrt{(P_1 - P_2)\, P_2}} = \frac{7 \times 10^6 \sqrt{.6 \times 520}}{1360\sqrt{(10)\,(364.7)}} = 1496$$

Miniumm required C_v

$$C_v = \frac{Q\sqrt{GT}}{680\, P_1} = \frac{.250 \times 10^6 \sqrt{.6 \times 520}}{680 \times 812.7} = 7.9$$

Rangeability

x : 1 = 1496 : 7.9

x = 190

190 : 1 = rangeability

Sizing Leading Control Valve

Assume 50 : 1 rangeability

C_v for leading control valve

$C_v \leq 50 \times 7.9 = 395$

Nearest size C_v = 360 (6″ double seated V-Port)

Sizing of Lagging Control Valve

Total C_v minus Leading C_v = Lagging C_v

1496 − 360 = 1336

Nearest size C_v = 1440 (12″ double seated, V-Port)

Leakage of Lagging Control Valve

C_v (.005) = leakage C_v

1440 (.005) = 7.2

Leakage of Lagging Control Valve + minimum controllable flow of Leading Control Valve equals minimum controllable flow for both valves.

7.9 + 7.2 = 15.1

which is too much.

Equivalent plug valve for lagging control valve is 8″ with C_v = 1450

8 foot 5...and they call him "TINY"!

Sometimes, names are confusing. Ours, for example, is "Tennessee Gas". But our pipeline begins in Texas . . . reaches to New Hampshire. Tennessee is only *one* of the 15 states served by our 9800 mile system. We're the nation's longest pipeline but we're in the oil business, too. We explore for and produce gas and oil from the Gulf to Canada . . . extract and convert their hydrocarbons . . . refine and market petroleum products. With our expanding activities, we cover a lot of ground. More than you'd think from our name.

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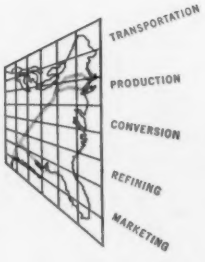


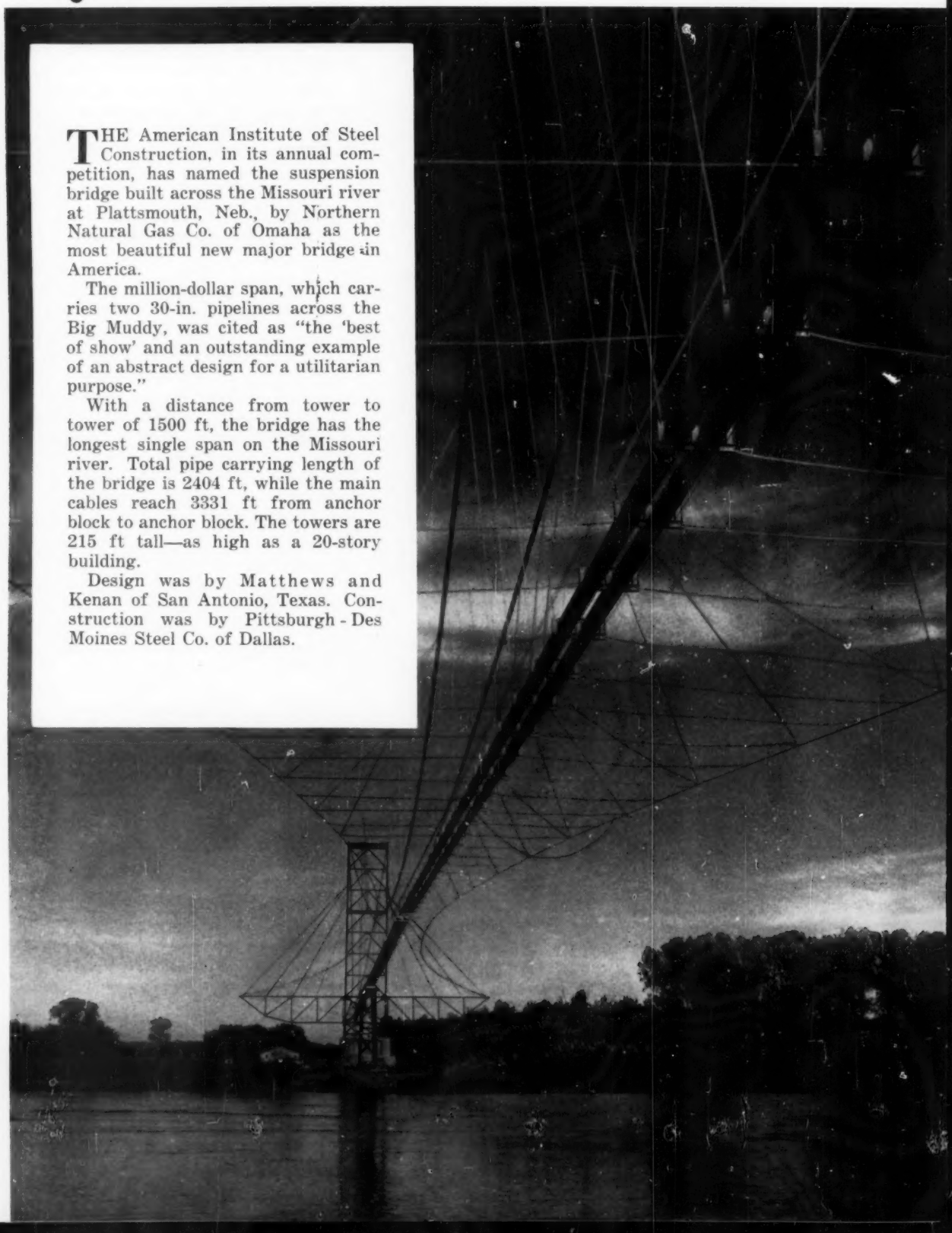
Northern bridge wins award

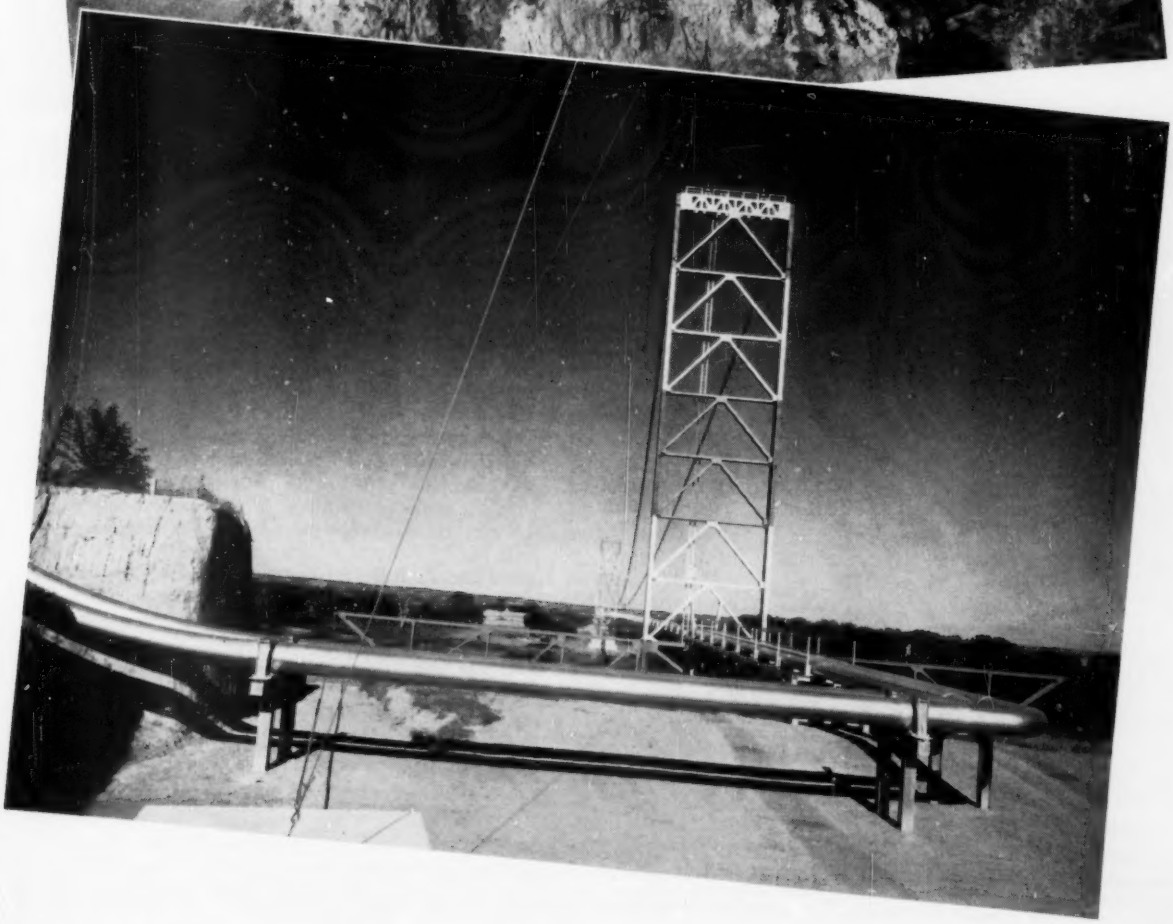
THE American Institute of Steel Construction, in its annual competition, has named the suspension bridge built across the Missouri river at Plattsmouth, Neb., by Northern Natural Gas Co. of Omaha as the most beautiful new major bridge in America.

The million-dollar span, which carries two 30-in. pipelines across the Big Muddy, was cited as "the 'best of show' and an outstanding example of an abstract design for a utilitarian purpose."

With a distance from tower to tower of 1500 ft, the bridge has the longest single span on the Missouri river. Total pipe carrying length of the bridge is 2404 ft, while the main cables reach 3331 ft from anchor block to anchor block. The towers are 215 ft tall—as high as a 20-story building.

Design was by Matthews and Kenan of San Antonio, Texas. Construction was by Pittsburgh - Des Moines Steel Co. of Dallas.





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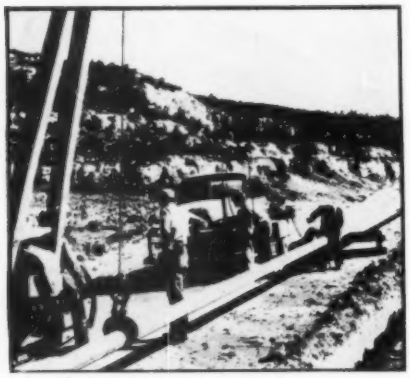

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In pipeline after pipeline—the uniformity, precision and high yield strength of Kaiser Steel electric weld pipe pays dividends in trouble-free performance.

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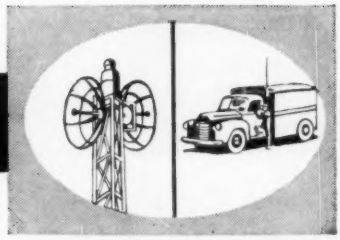
communications



Interest continues high in common carrier lease-maintenance investigation

By FRANK CHAPMAN

ALTHOUGH the Federal Communications Commission has postponed indefinitely the AT&T lease maintenance investigation, interest continues high with a cross-country exchange of statements and counter-statements. The postponement of the investigation, originally scheduled for Oct. 1, was granted because of a Justice Department statement questioning an AT&T proposed tariff for lease-maintenance service.

The Justice Department statement noted that due to great concern with the antitrust questions posed by the tariff, and the opinion that industry might be impaired, it should be rejected by the FCC. To this statement AT&T submitted a statement in reply alleging that "It (the Justice Department statement) is predicated on a misreading of the Communications Act, a misconception of the nature of the proceeding, and a misunderstanding of the facts."

Recently, the Department of Justice filed a new document entitled, "Reply Statement of United States of America," which indicates that it is taking a strong position against the acceptance of the AT&T tariff. From all indications the Justice Department would place the matter before the court for a judicial construction of the final judgment, based upon its less recent consent decree in the Western Electric case.

The Department of Justice also noted that the AT&T tariff filed with the FCC should be stricken and returned to AT&T, inasmuch as, "(1) AT&T is precluded from invoking the commission's jurisdiction to approve such a tariff, (2) no statute brings the proposed activity within the regulatory power of the commission, (3) the business of leasing and maintaining private mobile communications system is a private business and hence is not within the commission's regulatory sphere." In the event that the commission should approve the tariff, the Justice Department said, "We urge (1) that the tariff would violate Section III of the Clayton Act, and (2) that numerous antitrust considerations require a finding that approval of the tariff would be injurious to the public interest."

On the West Coast scene, with regard to the tariff filed by the Pacific Telephone & Telegraph Co. with the public utilities commission in California (which tariff is now on appeal before the California supreme court), PT&T was opposed to any move by the Federal Communications Commission to withhold actions on renewals or additions to existing systems, but had no objection to the commission abating action on applications from California companies for frequencies for new systems to be provided under the PT&T tariff.

The five California mobile radio installation-maintenance firms which asked for declaratory ruling withholding action on all applications involving private mobile service to be furnished by Bell until the FCC has finally decided the AT&T lease maintenance tariff, pointed out they are not involved in the lease-maintenance docket. In addition they pointed out that they have shown the necessity for the FCC to make a determination on the new issues they raised, "regardless of what the California Public Utilities Commission does."

Counsel for the California firms stated that the question of jurisdiction cannot be ignored. He noted the privately licensed radio stations whose inherent interstate effect brings their operations exclusively within the licensing provision of the Communications Act should not have the question of jurisdiction disposed of by mere reference to the authority of the California PUC.

Frequency assignments

The Electronic Industries Association recently petitioned the FCC to assign compensatory channels on a one-for-one basis within the affected band for each of the services losing frequencies as a result of the recent FCC-government trade. This followed FCC action to reduce separation between assignable frequencies in the 42-50-mc band, to bring about changes in the 25-50-mc band and 150.8- and 152-mc band, and to effect other changes relating to the use of frequencies in the 25-50-mc band.

At the same time the EIA requested that the FCC, in determining the specific frequencies to be made available immediately, consider the means for preventing new 20-kilocycle systems operating on clear channel frequencies from creating interference to existing 40-kilo-cycle users of other services. The EIA stated that if this is not entirely possible, the FCC might consider which services are geographically compatible. Accordingly, EIA requested that "the commission move to establish immediately the availability of compensatory replacement channels within the 42-50-mc band as they may be derived from the split channel frequency assignments set forth in the Appendix of Docket 12169," the docket amending certain parts of the commission's rules bringing about the above changes. ■

GAS pipeline news

New Canadian gas export policy may affect U.S. pipelines

FORMATION of a Canadian Commission to establish a policy regarding export, import and use of natural resources has caused considerable comment in the U. S. gas industry, and produced a wide difference of opinions as to the effect this move will have on the final outcome of several pending pipeline applications.

Three major projects—in either the proposed or planned category —are directly concerned with the outcome of the new commission's investigations and decisions. They are:

1. Midwestern Gas Transmission Co.'s proposal to import 200 MMcf/day initially from Trans-Canada Pipe Lines Ltd. at Emerson, Man. (Mid-western, a subsidiary of Tennessee Gas Transmission Co., is currently seeking FPC approval to build a 1100-mile system from the U. S.-Canadian border in Minnesota to Portland, Tenn., where it would join the TGT mainlines.)

2. Westcoast Transmission Co. Ltd.'s plan to expand its recently completed line from the Peace River fields of Alberta to the U. S. border where it sells gas to Pacific Northwest Pipeline Corp., and to build a new line from the Savanna Creek fields of Alberta to the U. S. border near Eastport, Idaho.

3. Pacific Gas & Electric Co.'s plan to build, through newly formed subsidiaries, a 1400-mile pipeline from Alberta to California.

Spokesmen for all companies concerned say that they are proceeding with their plans as if nothing had happened. All say that the formation of the new commission by Canadian Conservative Prime Minister John Diefenbaker will not create any new, and unexpected, roadblocks to their respective plans.

Opponents of these plans—and there are many—take a different view. They maintain that the FPC cannot issue certificates to any of these projects until firm gas supply contracts are signed. And, they point out, the new Canadian commission is at least a year away from establishing any new policies regarding the future export of Canadian natural gas. The six-man royal commission is headed by Toronto industrialist Henry Borden.

Trans-Canada is expected to be the commission's first target for investigation. The Conservatives in Parliament opposed the then-Liberal government's support of the pipeline in its early days, and have been constant critics of it since. It figures that the Conservatives will do some investigating here, if only for political purposes.

Trans-Canada officials haven't made any specific statements regarding the hearings, other than to say that they will welcome as an opportunity to clear up several points which arose during last year's lengthy — and sometimes heated—parliamentary debates.

Outcome of the expected Trans-Canada hearings will have a bearing on the fate of one U. S. pipeline proposal. This is Midwestern Gas Transmission, the TGT subsidiary now in the midst of seeking FPC authorization. Midwestern has already reached an agreement with Trans-Canada, and has a letter from C. D. Howe, Canada's commerce minister during the Liberal regime of Prime Minister Louis St. Laurent, saying that final Canadian approval would be forthcoming when the FPC required it.

In Washington, a Midwestern official told GAS that they are proceeding on the assumption that the letter of approval given to them by Mr. Howe will be honored. Midwestern is "not the least bit disturbed" over the Diefenbaker decision to appoint the commission and to refer to it the Trans-Canada problem.

This same spokesman says he doesn't believe Mr. Diefenbaker can afford to let the project be destroyed. When it comes to the cold, hard facts, the Canadians are fully aware they've got to live up to their commitments, he said. Midwestern points out that lots of Canadian money is involved in the project, and that the project needs the market to be really a success. In fact, the Canadian government has money in it. Canada can't stop now any more than we can arbitrarily turn off the U. S. gas that's being exported to Canada, he said.

Midwestern feels that Prime Minister Diefenbaker can get a policy statement out of his commission any time he wants it. And, even if this doesn't happen, there is no reason why the FPC couldn't issue a conditional certificate pegged on the outcome of the Canadian study.

Opponents of Midwestern naturally take a different view. They feel that no certificate could be issued by FPC until a firm agreement on importation of Canadian gas is reached.

Midwestern and Trans-Canada aren't the only pipelines who may feel the effects of the new Canadian policy, whatever it may turn out to be. Westcoast Transmission, the only current exporter of Canadian gas, told GAS that it intended to go ahead with its application to the Alberta Conservation Board for permission to export gas from the Savanna Creek fields. This application will be filed Dec. 10.

Several newly formed subsidiaries of Pacific Gas & Electric Co. could be affected by any future decisions of the new royal commission. PG&E last summer announced it would seek permission from Canadian governmental bodies and the FPC to build a 1400-mile pipeline from Alberta's prolific gas fields to California.

Officials of Alberta and Southern Gas Co., the PG&E subsidiary which is buying gas supplies in Alberta, say that plans are proceeding for the preparation of a presentation before the Alberta Conservation Board. No date has been set for the hearings, although they are expected to start within the next two months.

One of PG&E's new subsidiaries, Alberta and Southern Gas Transmission Co., formed to build gathering facilities within the province of Alberta, is about to bow out. The provincially sponsored Alberta Gas Trunk Line, which now gathers gas for Trans-Canada within the province, will do the same for the new PG&E subsidiaries.

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New York PSC appeals on FPC's CATCO order

New York's Public Service Commission Co. is seeking a court review of the FPC's ruling on the CATCO proceeding involving Tennessee Gas Transmission Co. and four independent producers working in the Gulf of Mexico.

The petition, filed in the U. S. Court of Appeals for the Third Circuit, states that the FPC's order represents an unwarranted reversal of the commission's previous orders in the same case which had contained conditions requiring subsequent justification of rates in excess of 18 cents/Mcf.

Transco plans financing

Transcontinental Gas Pipe Line Corp., Houston, plans $20 million of debentures in new financing and 1 million shares of additional common stock to be offered to the public.

A registration statement relating to both issues will be filed with the SEC shortly. Both offerings will be underwritten by groups headed by White, Weld & Co. and Stone & Webster Securities Corp.

El Paso Natural joins in synthetic rubber plant

El Paso (Texas) Natural Gas Co. and General Tire & Rubber Co. have dedicated "the world's most modern butadiene and synthetic rubber plant" at Odessa, Texas.

Built at a cost of $32 million, the plants rank as the nation's first privately financed and completely integrated synthetic rubber operation. General Tire's facility will produce 40,000 long tons of "Gentro" rubber annually from styrene and butadiene supplied directly from the adjacent plants of El Paso.

Five-company plan boosts Chicago supplies

An additional 485 MMcf/day will be heading toward Chicago area markets when construction gets underway on a recently authorized project.

Certificates for the $182 million job went to Natural Gas Pipeline Co. of America, Texas Illinois Natural Gas Pipeline Co., and Chicago District Pipeline Co., all of Chicago; Pacific Northwest Pipeline Corp., Salt Lake City; and Colorado Interstate Gas Co., Colorado Springs. The applications are interdependent, forming primarily a unified proposal to make available additional gas supplies to the Chicago area.

Among other things, the FPC presiding examiner's decision authorizes Pacific Northwest to sell gas to Colorado Interstate. CIG in turn will make sales to NGPL. The three Peoples Gas Light & Coke Co. affiliates (NGPL, Texas Illinois, and Chicago District), operate as a single integrated system

Natural's project, estimated to cost $76 million, includes construction of 415 miles of 36-in. loops between Beatrice Neb. and Joliet, Ill. This will increase its system capacity by 450 MMcf daily. Also included is the supercharging of 86 mainline compressor engines in Oklahoma, Kansas, Nebraska, Iowa and Illinois. Temporarily authorized last April, this portion of the job will add 35 MMcf/day to sales capacity. The examiner's decision requires Natural to submit to the FPC "an equitable plan" for distribution of this 35 MMcf at least 10 days before commencing delivery.

The decision also approves a plan whereby Natural will become the sole seller to customers of itself and Texas Illinois. Natural will buy all gas delivered by Texas Illinois and make its present system and the proposed additions available to Texas Illinois' customers as well as to its own present customers.

The part of Natural's application involving sale of 115 MMcf/day to two of its customers for resale to United States Steel Corp. and Inland Steel Co., previously had been severed from this proceeding and consolidated with competing applications of Midwestern Gas Transmission Co. The decision is conditioned to require that Natural must obtain from one or more of its principal customers firm and definite commitments to purchase this 115 MMcf on a temporary basis prior to commencing construction of its new facilities.

Texas Illinois was authorized to abandon its sales, to be made by Natural in the future, and to construct two metering and regulating stations.

Chicago District will increase its system capacity by 456 MMcf/day. The project includes construction of 52 miles of 36- and 30-in. loops between Joliet and Chicago. Cost: $13 million.

Colorado Interstate will build more than 700 miles of pipeline and install 60,980 hp in new and existing compressor stations. This program will cost about $86.9 million. The new facilities will be in Colorado, Oklahoma and Kansas, and will in part replace old facilities. In addition to giving better service to its Rocky Mountain customers, CIG will be able to deliver a maximum of 460 MMcf/day to Natural at Beatrice. When the new deliveries to Natural get under way, Colorado will discontinue its present 50 MMcf/day deliveries to Natural at another point. CIG's authorization requires the company to submit a feasible financing plan prior to the beginning of construction by CIG, Natural, or Chicago District.

Pacific Northwest will spend $5.7 million in order to sell 117.5 MMcf/day to Colorado Interstate. This sale will be in addition to a similar amount already being sold to CIG. Included in PNW's project is installation of 22,500 hp in existing compressor stations. This authorization is also conditioned to require Pacific to obtain FPC approval of a more definite proposed plan of financing prior to beginning construction of the compressor facilities.

Antitrust judge denies dismissal motions

The government won the first round in the antitrust fight between El Paso Natural and the State Department when District Judge Willis W. Ritter held that his court has jurisdiction. He also denied motions for dismissal and stay of proceedings asked by attorneys for El Paso and Pacific Northwest Pipeline Corp.

Defense Counsel Authur Dean declared that he would immediately petition the Supreme Court for a writ of certiorari, which in effect is an appeal of Judge Ritter's ruling on the motions.

The judge also ruled that El Paso and Pacific must open their records to the government to supply information for the up-coming trial.

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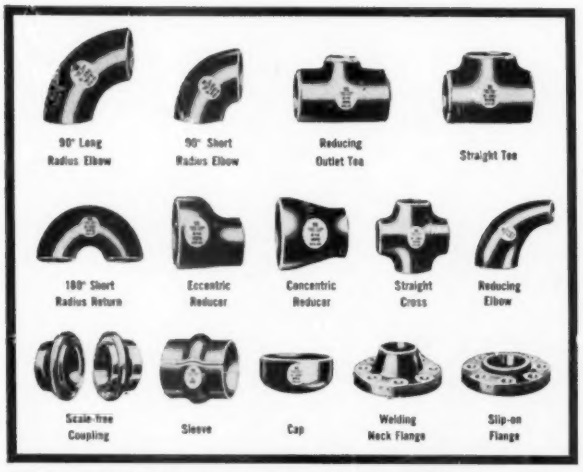

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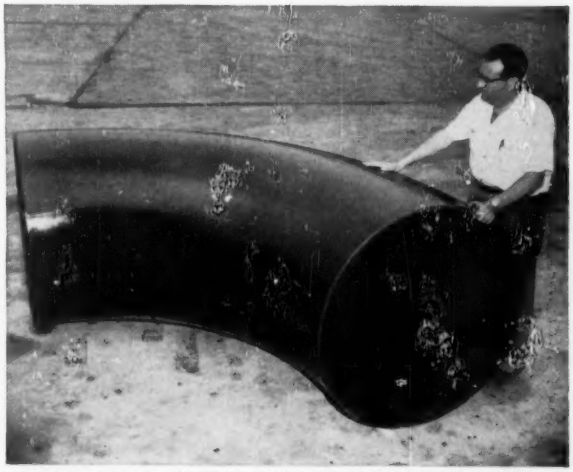

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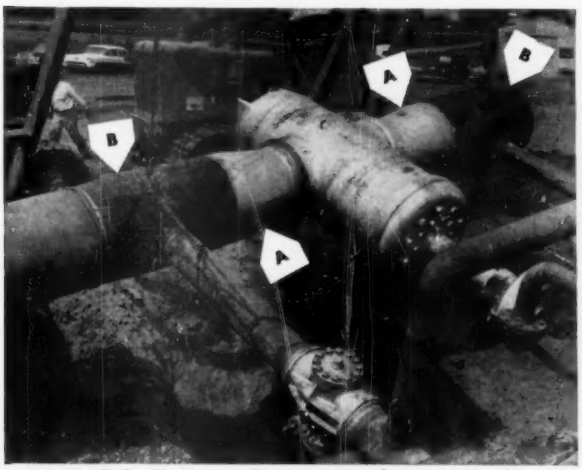

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the 11 western states had filed motions in the court supporting either dismissal of the complaint or a stay of proceedings until the FPC rules on the merger application of the two firms.

"The narrow question involved here is whether the stock acquisition was in violation of section 7 of the Clayton Act," Judge Ritter said. "This issue cannot be presented to the FPC because it does not have jurisdiction."

Government attorney Ephrain Jacobs earlier said the FPC has no authority in enforcing the Clayton Act and that the government has no remedy for an illegal stock acquisition "except in this court."

Lawyer Dean contends that the U. S. District Court does not have jurisdiction over the case, and it is up to the FPC to rule on the merger application first. Only legal evidence would be heard in federal court, he said, which would overlook far-reachng "economic evidence directly affecting the consumer."

TGT acquires reserves in south Texas

Tennessee Gas Transmissinn Co., Houston, has acquired producing and undeveloped gas properties in Hidalgo and Karnes counties in south Texas. Included is an interest in nine completed gas distillate wells and three more which are being drilled.

The purchases add approximately 110 billion cu ft of natural gas and 1.5 million bbl of liquids to the company's reserves.

Home Gas gets go-ahead for new facilities

Home Gas Co., which in August received temporary authorization, now has the final go-ahead from the FPC to build $3.8 million facilities in New York.

The Pittsburgh-based company will install and operate about 14 miles of storage field lines and other facilities needed to activate and operate an extension of its Dundee storage field. It will also build about 19.5 miles of 16-in. transmission line from Dundee compressor station to a connection with its existing system in Steuben county.

At the present time, estimated peak-day deliverability from Dundee is 32.8 MMcf. Home Gas estimates that its requirements from the field on peak days from 1958-1962 would range from 39.8 MMcf to 51.2 MMcf.

Cities Service gets okay

Under recent FPC approval, Cities Service Gas Co., Oklahoma City, will construct, operate and replace gas facilities in Kansas at a cost of $6.4 million.

The company will install 41 miles of 30-in. line from the Verdigris river to the Petrolia compressor station; 33 miles of 30-in. between Petrolia and the Welda station; four miles of 4-in. in Wilson county; and six miles of 12-in. in Reno county.

Southern and Suntide drop acquisition plan

Negotiations involving the acquisition of Suntide Refining Co. by Southern Natural Gas Co., Birmingham, have been terminated by mntual consent. The announcement was made by Christopher T. Chenery, chairman of Southern's board, and Floyd B. Martin, president of Suntide.

Hearings under way on Union Producing status

Hearings got under way last month following FPC's order directing Union Producing Co. to show cause why it has not filed rate schedules or obtained certificates covering its natural gas sales subject to FPC jurisdiction.

The commission's order directed Union also to show cause why it is continuing to engage in the sale of natural gas, subject to FPC jurisdiction, since it has not filed any rate schedules or obtained certificate authorization. Union must also show the FPC why the commission should not bring action in a U. S. district court to stop such acts or practices and to enforce compliance with the Natural Gas Act and the commission's rules, regulations and orders thereunder.

The commission claims that evidence submitted by Union Producing and its affiliate, United Gas Pipe Line Co., also its principal customer, shows that there is a continuous and uninterrupted flow of natural gas from Union's wells through United's pipelines to ultimate intrastate and interstate destinations. Also, that "Union is engaged in the sale of natural gas in interstate commerce for resale for ultimate public consumption." The FPC said the submittals also show that Union owns and operates facilities which are used to effect the sale of gas to United and others and that these "facilities are sales facilities and subject to the jurisdiction of the commission."

Somerville expands

Robert B. Somerville Co. Ltd., Toronto, has expanded its capital and personnel resources through an arrangement with the Sir Robert McAlpine & Sons Co. Ltd., Toronto and Montreal.

McAlpine has purchased an interest in Somerville and assigned Ian Little to the Somerville staff. This move will serve to increase the growth potentiality of the company in the field of pipeline construction and maintenance.

Ohio Fuel boosts gas supply to western Ohio

Work was expected to be completed last month on a $566,000 constructon project that will enable Ohio Fuel Gas Co. to increase gas deliveries to several Ohio communities.

About 10 miles of 20-in. pipe was laid from Mount Gilead in Morrow county to Richland township in Marion county. The line parallels an existing line, providing a twin feed to markets in the western part of the state. It will increase gas deliveries to the area by almost 20 MMcf/day.

Another jurisdictional case goes to high court

A petition for *certiorari* has been filed in the Supreme Court on behalf of Shell Oil Co. in a jurisdictional case involving the FPC. The issue covers sales of casinghead gas which the company makes at the lease separator to a processer, who, in turn, resells to a buyer for further processing and transmission to other states.

The Fifth Circuit Court ruled that such sales are sales "in interstate commerce" and "for resale"

Ohio Oil's Kenneth Burns, Manager, Procedures Research and Machine Accounting Division, examines payroll data tape.

How private line teletypewriters send data to fill out 6500 Ohio Oil pay checks

Payroll information on The Ohio Oil Company's 6500 employees comes into Findlay, Ohio, headquarters by private line teletypewriter service from ten distant locations as far west as California: six production and two marketing points, one refinery, and the research center in Denver.

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Among other jobs, the teletypewriter network gathers basic personnel data from distant production locations. The tape is processed through business machines. Computations are made by an electronic "brain." And pay checks are issued promptly and accurately twice every month.

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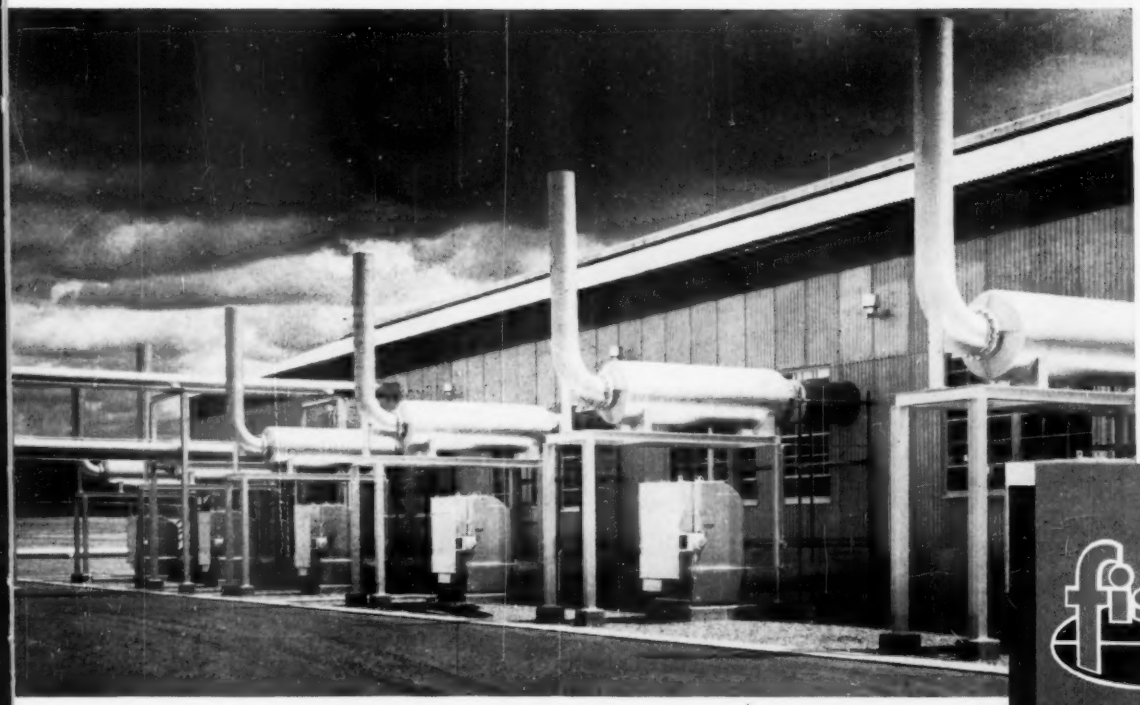

Compressor Station One is the key supply installation on the sprawling Pacific Northwest Pipeline system. Located at 6000 feet elevation near Ignacio, Colorado, the facilities boost pressure of nearly 300-million cubic feet of gas per day from the San Juan Basin gathering system. This station feeds a nearby gasoline plant before starting the gas on the long haul to the Pacific Northwest market.

In such a key spot, dependability is essential. Fish engineers carefully reviewed possible causes of trouble long before thoughts went into plans.

Extreme temperature fluctuations—from plus 100 degrees F. to minus 20 degrees F.—posed unusual problems. Under these conditions, reliable temperature control was difficult to achieve.

To be sure of providing efficient jacket water and lube oil temperatures under all extremes of ambient temperature and load, Fish designers elected to use unitized systems. Under this system, each engine has its own atmospheric cooler to take care of jacket water and lube oil cooling loads. A system of temperature control instruments was installed to provide very close control under all operating conditions. As designed, this remote station demonstrates extreme flexibility with reliability.

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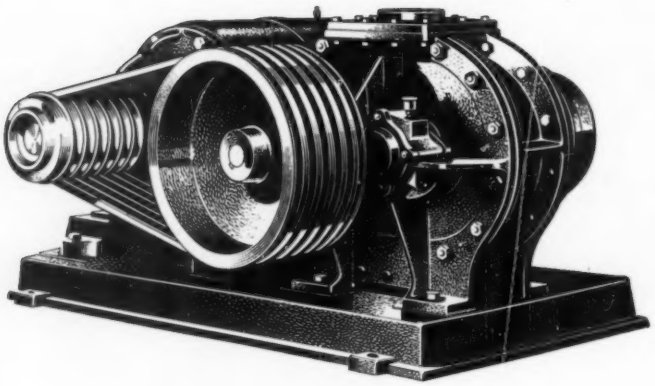

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within the meaning of the Natural Gas Act's grant of regulatory jurisdiction to the FPC.

Shell challenges the lower court's interpretation of the Act, and also raises the question as to whether, if the sales are "in interstate commerce" and "for resale," they are not subject to the production and gathering exemption provision of the Act.

El Paso files plan

El Paso Natural Gas Co. plans to construct 4½- to 20-in. field laterals, each single project not to exceed $500,000 and the aggregate cost not to exceed $1.5 million; compressor facilities varing in size from 300 to 1600 hp, with aggregate cost not to exceed $1.5 million; purification and/or dehydration and appurtenant facilities, not to exceed $1 million; and additions and alterations to existing gasoline plants, not to go over $1 million.

El Paso said the purpose of the facilities is to attach new supplies of gas from independent producers in the general area of its existing transmission system where expansion of its overall facilities is not involved.

Major pipe expansion gets under way at Kaiser

Kaiser Steel has begun a $2 million expansion at its Napa, Calif. pipemaking plant.

When completed in 1959, the expansion will nearly double the fabricating division's pipemaking capacity, making it one of the largest plants in the world for fabrication of line pipe for gas and petroleum transmission.

Major facilities under construction include a 50,000-sq ft addition to the pipe fabrication plant to house additional welding, facing, expanding and testing facilities, new buildings, and more handling and storage areas.

The Napa plant produces electric weld pipe from 6¾ in. to 20 in. in diameter and expanded fusion weld pipe from 20 in. to 36 in. in diameter. The new facilities will make it possible for this plant to produce pipe up to 42 in. in diameter.

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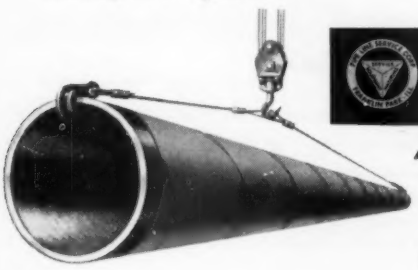

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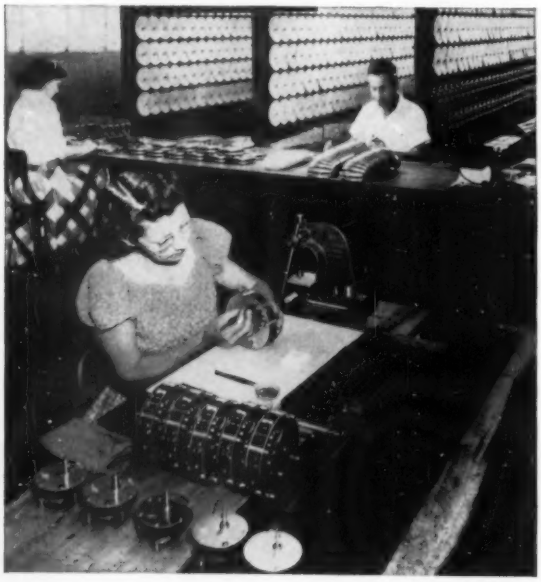

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Washington • *Cont'd.*

(*from page* 19)

say, and they say they plan to bring it up early.

As the fight develops over the bill, opponents will try to make big political pay out of the government's stepped up antitrust activity against pipelines. Except for the El Paso Natural Gas Co. case, the Justice Department and congressional committees have been concentrating their allegations of antitrust misbehavior against oil pipelines, but the politicians know the public tends to link the gas and oil industry as a single unit, and they'll take advantage of this to renew old charges that natural gas production and transmission lack strong competition.

* * * * *

With the gas bill a doubtful candidate for enactment, the gas industry had better keep a watchful eye on several cases due to come before the U. S. Supreme Court in the next few months.

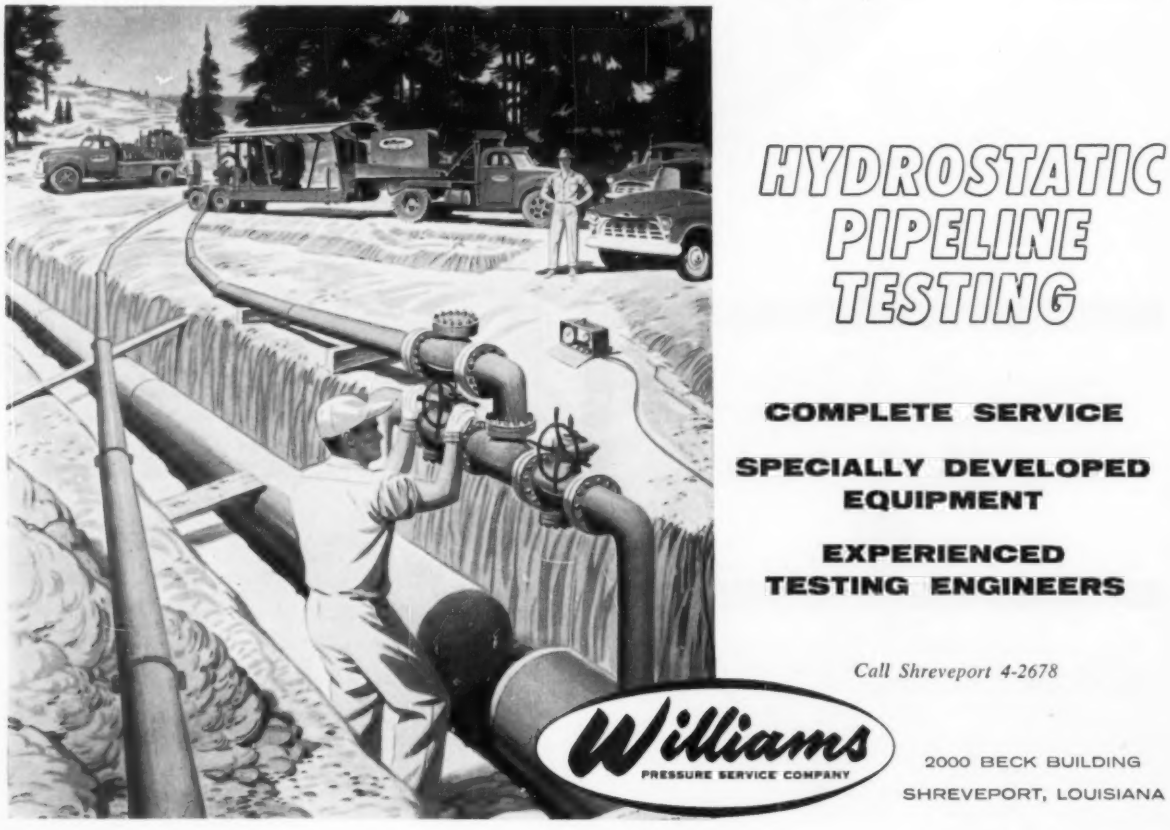
The court has been asked to decide whether gas sales to a processing plant come under FPC control and whether a state-set minimum price on wellhead sales of gas is valid, or whether it is in conflict with federal gas controls. The question of whether federal controls over the gas industry as established in the Phillips decision apply to nonintegrated independent producers also may reach the high court this year.

On the question of gas sales to a processing plant, the court is being asked to overthrow an FPC decision, upheld by a circuit court of appeals, that these sales do come under the federal gas act on the theory that gas moves from the well to the interstate market "in a continuous flow."

The case, involving the FPC and the Deep South Oil Co., Continental Oil Co., Shell Oil Co., and Humble Oil & Refining Co., revolves around a contention by the companies that processing of natural gas constitutes an "interruption" in the flow of gas into interstate commerce. The firms cite rulings in similar cases involving cotton and logging as examples to support their argument.

The firms also argue that while the Phillips decision involves gas which has been processed, Congress in the Natural Gas Act apparently exempted production and gathering, and there is therefore a jurisdictional vacuum between well and processing plant which the court should clear up.

Gas producers say a case now before an appellate court at Denver, involving Saturn Oil Co. vs. the FPC, in which several independents have joined, is the most important now before the courts. The independents are claiming that the Phillips decision imposing federal controls over independent gas producers applies only to the large, integrated producers, and not to those without processing facilities. If the Denver court rules against the producers, they expect to bring it to the Supreme Court, and it could be handled with the other two cases. ■



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Use of a plug valve as a control valve

(*Continued from page* 104)

Milpitas gas line. At the time of the original design of this pipeline the engineers did not contemplate that these valves would be called on for throttling service except during periods of operating difficulties. As it has turned out, during its six years of service, the pressure limiting station near the terminal end of the line has been called on to serve as a regulator some 70 per cent of the time. This valve has met rangeability requirements of 40 to 1, and has needed no maintenance on the valve proper other than lubrication.

Noise control

The very thin orifices of the conventional control valve in the almost closed position make excellent whistles and the resulting noise can often become a nuisance if not a hazard. Many companies now make a practice of using plug valves as control valves in congested areas with the intention of burying both the valve and the resulting noise.[10] In some cases the plug valve may make less noise than a conventional control valve in the same relative degree of closure because of the shape of the restricting orifice.

The plug valve used as control valve should not be considered as a panacea, but more properly as one of many control valves available. The selection of a control valve should be based not only on the capacity of the valve, but also on the ability of the valve to maintain control throughout the specified range of flow. If a plug valve is properly sized, it offers many desirable features in terms of ability to control a wide range of flow. ■

[1] See Appendix I.

[2] Washburn, W. D., and Milam, R. *Terminology of Process Control Valves,* ASME Paper No. 55-A-91.

[3] See Appendix II.

[4] Washburn, *op. cit.*

[5] See Appendix II.

[6] *Ibid.*

[7] Gorrie, H. H., and Gantz, W. L., *Practical Limitations of Current Materials and Design of Control Valves,* ASME Paper No. 55-A-113.

[8] See Appendix II.

[9] See Rockwell Manufacturing Company Bulletin V-602.

[10] Partridge, R. M., *Gas Regulation and Noise Control,* PCGA Proceedings, Vol. 43, 1952.

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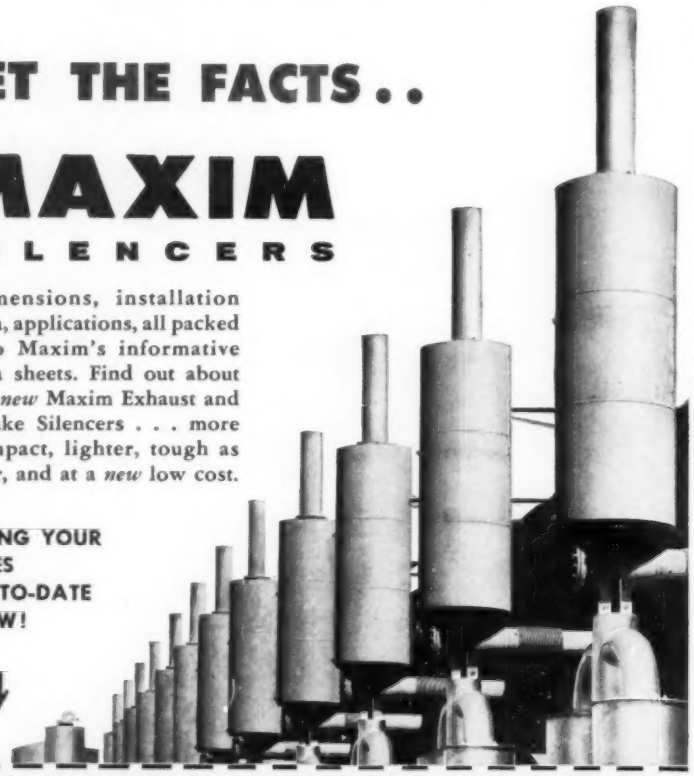

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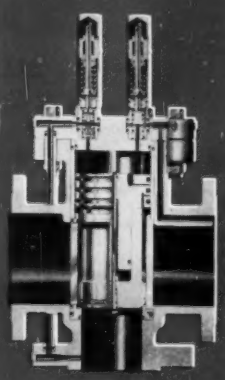

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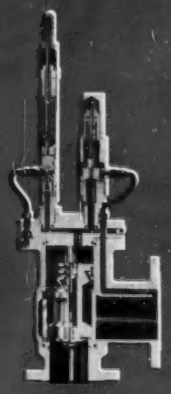

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Regulatory Trends •

(*from page* 11)

ture, financial history and past operations should be considered.

9. The return should accomplish, among other things, due recognition of efficiency or lack of efficiency in management.

10. The future prospects of the utility, its taxes and development, the potential stimulation from reduced rates and the character of the service should be considered.

The recent increase in the cost of debt capital has had its influence on the upward trend in the rates of return allowed to utilities by regulatory commissions. The California commission recognized in its latest gas rate decision that a 1957 sale of bonds by the gas company was at a 5.1 per cent interest rate compared to an average historical cost of bonds of 3.12 per cent in 1954 for the same company.

For the nine rate decisions in 1956 the average allowed return in the United States for natural gas distribution companies was 6.3 per cent. A significant increase has materialized during 1957. For the six natural gas rate cases, the average return authorized climbed to 6.7 per cent.

California is trying to catch up with other regulatory agencies by its recently allowed 6.75 per cent return, but is behind Pennsylvania. California uses a depreciated original cost rate base while Pennsylvania employs a higher present fair value rate base. Translating the latest natural gas rate increase allowed by Pennsylvania to a comparable rate base of original cost of property less accrued depreciation the rate of return amounts to 8 per cent.

Many commissions, including California, have to prescribe rates for utilities that are growing so fast that an inevitable decline takes place in the realized earnings. When new facilities are added and old property is replaced at present costs, which are much higher than historical costs, then current gas rates must be increased to become compensatory.

The California commission, in its latest gas rate decision, evaluated the declining trend in realized return caused by expansion and customer requirements. On an adopted rate base of $352 million it added one-half of 1 per cent to the selected return to offset the expected erosion in earnings for the future. The commission asserted:

"In considering the question of rate of return the commission has considered its former finding of 6 per cent as a fair rate of return in Decision No. 50742 dated Nov. 3, 1954. The commission, in that decision, recited a number of elements which were considered. Among them was the cost of money which has increased substantially since the date of that decision. The applicant is faced with a continuing construction program of substantial proportions to meet the needs and lawful demands of its customers which this commission requires applicant to meet. Facilities must be provided in time ahead of the need therefor and by applicant's own direct financing, or indirectly through financing of Pacific Lighting Corp.

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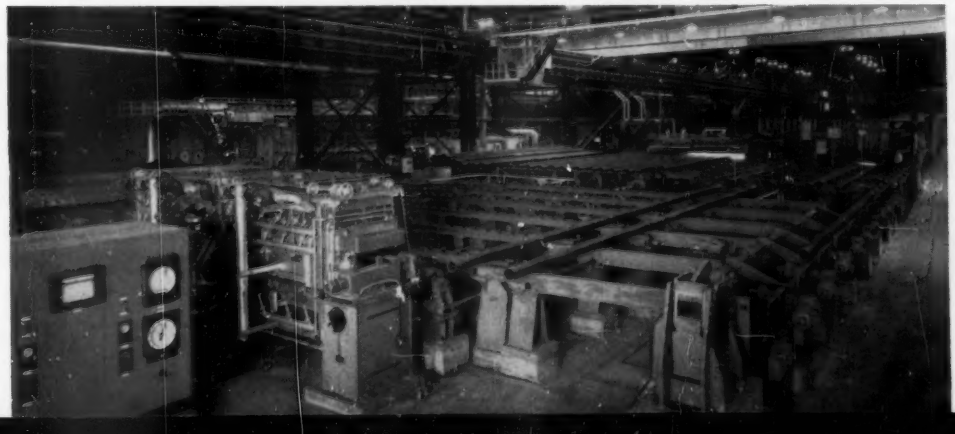
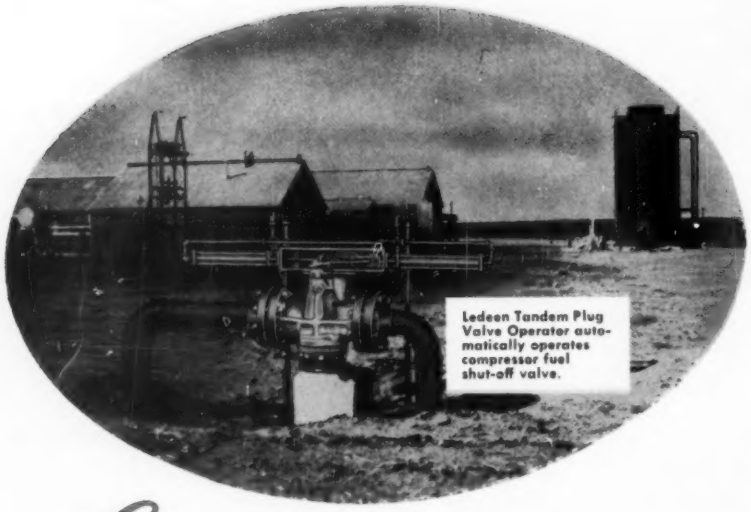
Upset finishing mill, Youngstown, Ohio. Also a fully automated mill began operations September 15. Contains a pair of automatic upsetters with attendant furnaces plus a full-length normalizing furnace for highest quality control of all products. This mill adds to our capacity for Drill Pipe in grades D, E, x-95 and in Upset Casing (Speedtite). Photo shows upsetter and control panel in foreground, normalizing furnace in left rear.





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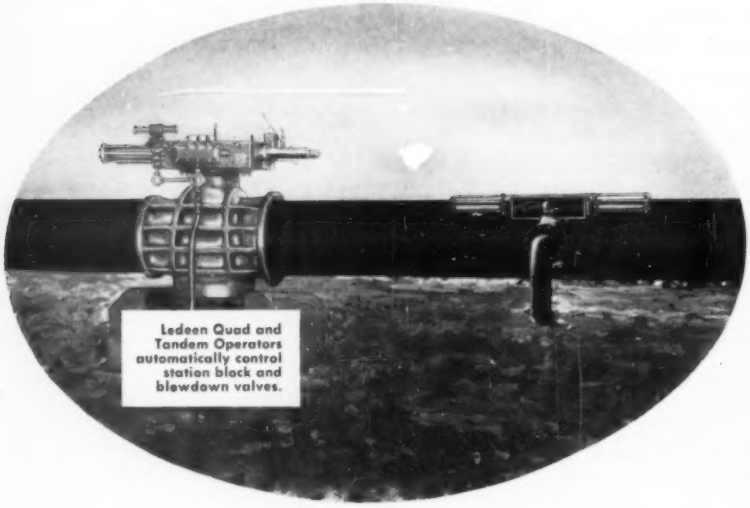

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WRITE FOR BULLETIN 2020

Analysis of applicant's earnings over the past several years discloses a definite and constant decline in its rate of return to the point that applicant seldom, if ever, has been able to earn the rate of return heretofore found by this commission to be fair and reasonable.

"As of the month of August 1957, applicant, with Southern Counties Gas Co. of California, has completed and put into operation new pipeline facilities needed to transport the additional out-of-state gas supply. These new facilities and other major improvements represent a large expenditure of new capital with a resultant depressing effect upon rate of return unless recognition is given to the actualities. These new facilities will be in operation during the full first year after the rates authorized by this decision are in effect, and, without establishing any precedent, the commission is of the opinion that the effect on rate of return of the new pipeline and other facilities heretofore constructed, and placed in operation during the test year 1957 should, in equity and justice, be considered. This can be done by recognizing and allowing for a substantial down trend in the rate of return, which we estimate to be 0.50 per cent. We will therefore set the rates at a level which would have shown a rate of return of 7.25 per cent on the adopted results for the test year 1957 as shown on Table 1, and which should enable applicant to earn a 6.75 per cent rate of return in the immediate future. Such rate of return we find fair and reasonable for the future."

Even though California has improved its regulatory climate to enable the utilities to compete on more nearly equal terms for the investors' money, there are growing pains ahead. Population predictors estimate that California will grow by in-migration and internal reproduction to a total of 18 million people in 1965. It will require periodic rate increases for all utilities, including natural gas companies, to keep earnings at a level sufficient to maintain credit and to attract the necessary money to finance new facilities. ■

THE day you begin coating and laying your pipeline is the day you write your own ticket on future maintenance costs.

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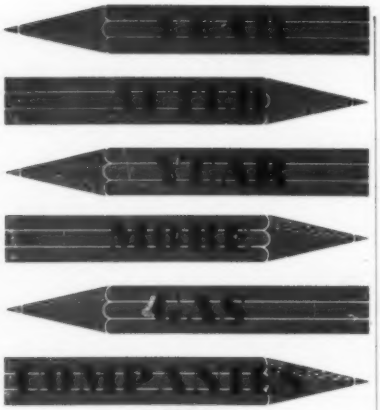

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GAS pipeline people

CLARK H. CRAFT has been named chief engineer and RALPH W. HOWE superintendent of measurement for Texas Eastern Transmission Corp.'s Little Big Inch division. Both of the men have been serving as engineers in the company's natural gas division.

LYNN D. ERVIN, who has been active in the geophysical phase of oil exploration, has joined the Tennessee Gas Transmission Co. headquarters exploration staff as chief geophysicist. The Houston-based company also has named J. M. BROWNING staff geologist for overseas operations.

GEORGE W. COMANICH has been promoted to division engineer in Texas Eastern Transmission Corp.'s Division II headquarters at Seymour, Ind. Prior to his promotion, he was senior assistant engineer in the general office pipelines department in Shreveport.

HENRY H. SWIGERT has been elected treasurer of Cities Service Gas Co., Oklahoma City. Mr. Swigert, who is a director of the company, succeeds R. L. MORTON, who remains as vice president and director of the company.

D. N. CANFIELD, formerly assistant manager of the land department for Pacific Northwest Pipeline Corp., is now division landman for El Paso Natural Gas Co. at Farmington, N. M.

DENNIS L. GALLOGLY has been promoted to assistant executive engineer by Cooper-Bessemer Corp., Mt. Vernon, Ohio. Mr. Gallogly's former post of chief engineer, product division, will now be managed by R. F. KYMER, who was previously assistant chief engineer. Reporting directly to Mr. Gallogly will be Cooper-Bessemer's three basic engineering divisions. WALTER H. KRAEMER has been assigned to the company's Chicago office. He will be responsible for direct contacts with users of engines and compressors in refineries, chemical, and petrochemical plants throughout the Midwest.

J. D. WILLIAMSON has joined Trunkline Gas Co., Houston, as a staff geologist in the production and supply department.

Youngstown (Ohio) Sheet & Tube Co. has promoted two officials of its Campbell Works. ED O. REESE, formerly general superintendent of flat rolled and tubular products, is now manager of the Youngstown district. JOHN H. STONE, assistant superintendent, seamless tube mill finishing department, succeeds Mr. Reese.

JOHN H. CALDWELL has been promoted to assistant sales manager of the Protective Coatings division, Pittsburgh Coke & Chemical Co. He will be in charge of the division field sales force and will supervise regional sales managers in New York, Chicago, Houston, and Los Angeles. Mr. Caldwell formerly was regional sales manager in Houston. The firm's industrial chemicals division has named EDWARD E. FINNEY as a sales representative in eastern New Jersey, Brooklyn and Long Island.

GEORGE W. EDICK has been promoted to sales manager, domestic division, of Cooper-Bessemer Corp., Mt. Vernon, Ohio. In his new capacity, Mr. Edick will represent management in all matters pertaining to branch office operations including sales of engine and compressor equipment, warehousing and servicing. He will also be responsible for coordinating sales activities under the direction of Grant C. Woodard, general sales manager.

Henry Swigert
Cities Service

Walter Kraemer
Cooper

R. F. Kymer
Cooper

Dennis Gallogly
Cooper

GAS

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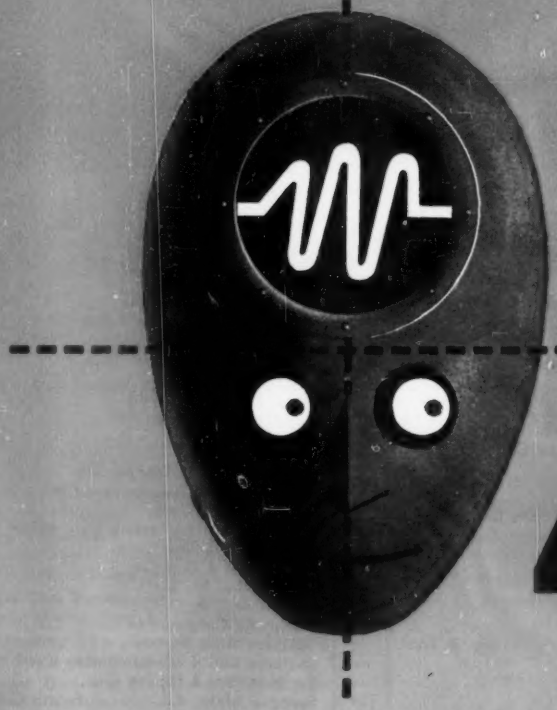

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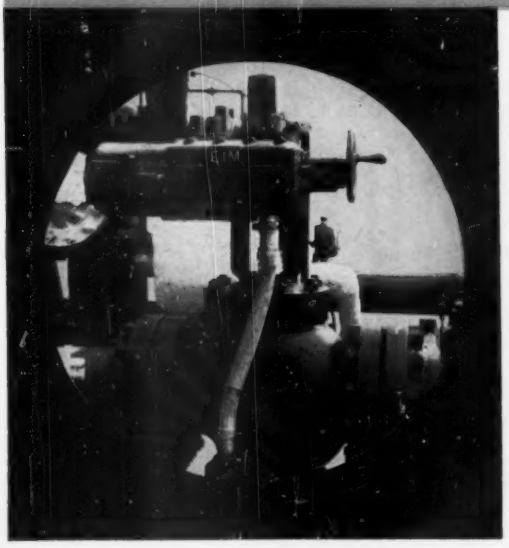

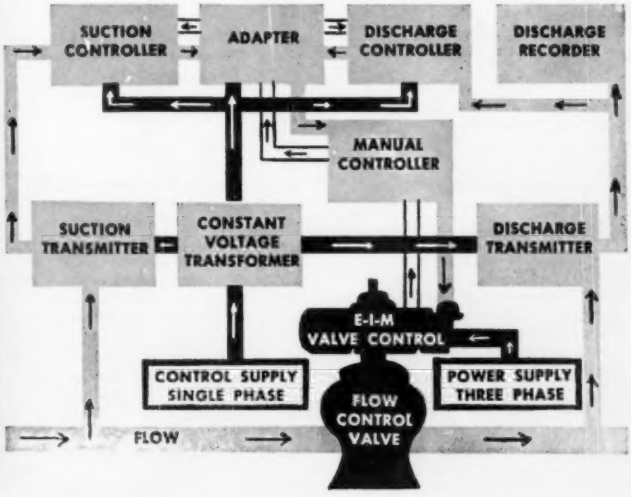

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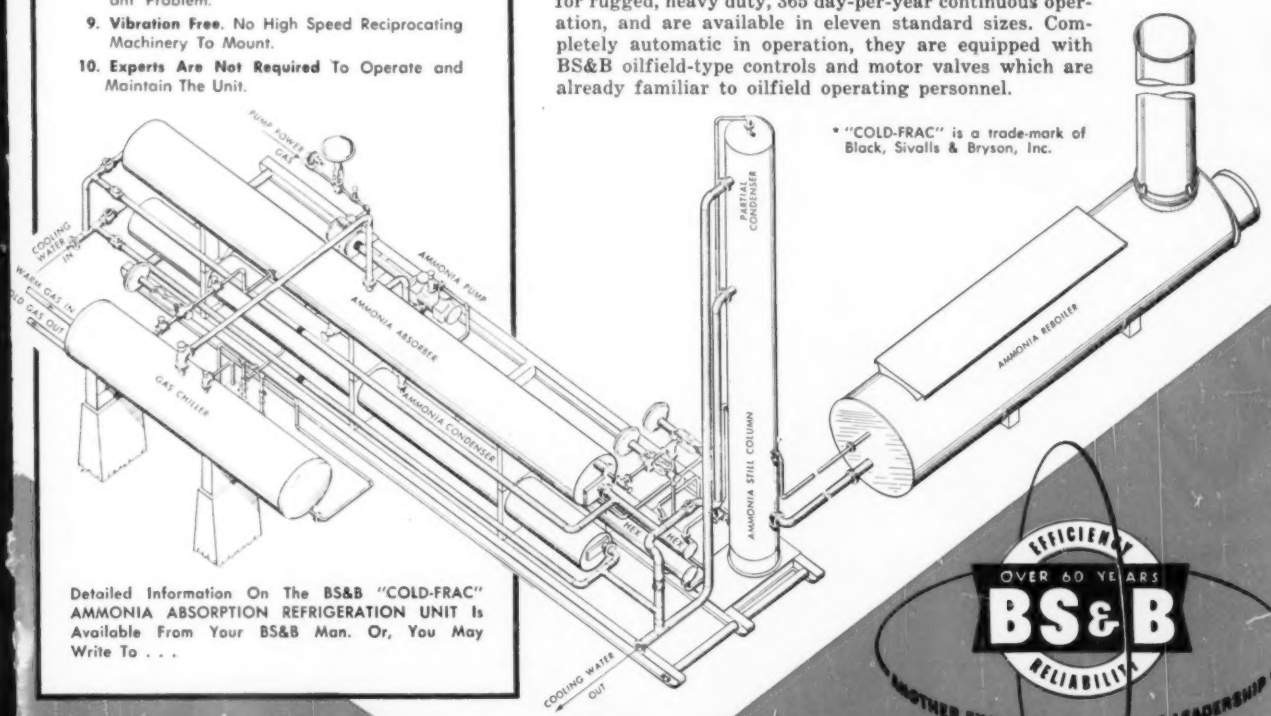

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